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THE NEED FOR MORE ACCURATE DATA IN REFUSE DISPOSAL WORK.

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In olden times all city refuse that could not be utilized was generally dumped at unobjectionable places. It could be dumped mixed, and, therefore, could also be collected together. Waste food, if suitable, was fed to animals and collected separately. The rag picker was also allowed to separately collect and remove all salable articles.

At the present time the conditions of town life have changed. We can no longer utilize most of the rejected food matter for feeding, except in small towns. We now discard more rubbish, our fuel varies more as to its kind and the quantity used, we can no longer use the older and crude methods of collection and delivery, we have materially increased the distances to which refuse must be delivered and we are abandoning the disposal by dumping except with ashes.

The problem of refuse disposal has, therefore, become more complex than formerly, and this complexity may not yet have reached its limit. In order that correct solutions for the test methods of disposal may be found, both from the standpoint of sanitation and economy, it is necessary to inquire into details far more than formerly, so as to have more definite facts and figures with which to solve the problem. The more accurate information now required is necessary for the varying special conditions existing in different communities. In short, we must have

more special data and statistics before we can indicate the best methods for the disposal of a particular town's refuse.

At the outset we should know what the refuse consists of, and ascertain and discriminate between its various parts, which may be enumerated as being garbage, dead animals, night soil, manure, street sweepings, ashes and rubbish.

There are in satisfactory use in the different cities of the world, five different methods of refuse disposal, namely, incineration, reduction, burial or plowing into ground, dumping and feeding.

Garbage may be incinerated, reduced to grease and fertilizer, buried or fed to pigs.

Dead animals may be incinerated, reduced to grease and fertilizer, or buried.

Night soil may be incinerated, buried or plowed into the ground.

Manure and street sweepings may be incinerated or plowed into the ground, or sometimes simply dumped on land.

Ashes may be used for incineration, on account of the percentage of unburned coal which they usually contain, or used for land making by dumping.

Rubbish must be incinerated.

Next, we should know the quantities and have an analysis of each kind of refuse, so as to determine its calorific value, if the disposal is by incineration; the fat and grease value of garbage, if disposed of by reduction; and the degree of resistance of the organic matter to putrefaction and to other forms of decomposition. Such data will aid in judging the availability of the several methods of disposal.

We also need data regarding cost, not only of converting each part of the general refuse into valuable products, or of other dispositions, but of collecting and delivering the materials from the point of origin to that of final disposal.

All this information is essential to form a judgment both as to the efficiency of the disposal and as to its total cost. It would be surprising to many to see how materially the total cost may be affected by the length of haul and the character, time and frequency of delivery, and how this cost of collection may affect the economical choice of the method of disposal.

Another set of data, that would assist in planning for the best method of collection, refers to the house treatment of the refuse. When we consider the disposal of only the three most important parts of the refuse, namely, garbage, ashes and general rubbish, the design of the house cans and collecting wagons and the cost of the collection will be materially different, if we have a combined collection of all refuse, or a two-can col-

lection (one containing only garbage), or a three-can collection (one can containing only garbage, another only ashes).

In compiling statistics such as have been mentioned, and for the purpose of getting from them the greatest possible good, it is essential, further, that the routine reports from different cities should be annually summarized in some standard form so that proper comparisons may be made.

With such accurately compiled data cities would be enabled to dispose of their refuse, not only more efficiently, but also more economically for the same degree of efficiency attained.

REFUSE MATERIALS.

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Read before the Sanitary Engineering Section, American Public Health Association, Washington, D. C., September, 1912.

The fundamental consideration in refuse disposal must be the materials to be dealt with. No investigation on which designs are to be based can properly be made unless accurate data relative to the refuse materials to be handled are available. Therefore, any meeting of engineers where the refuse problem is to be discussed should be started with a discussion of refuse materials. Such a discussion should include the following points:

(1) The definitions of refuse materials.
(2) The classification of these materials.
(3) The quantities of refuse.
(4) The proportions of refuse.
(5) The composition of refuse.

(1) No discussion is complete unless the fundamental terms of the subject under discussion have been made clear. There is, unfortunately, a considerable difference in different localities in the meaning of the various words used to describe refuse materials. Broadly speaking, refuse is the solid waste resulting from the organic life of a community. The general term "Refuse" includes the following kinds of refuse:

1. *Public refuse*, which is the cleanings from public streets and alleys, includes snow, street sweepings, leaves and waste building materials piled on the streets.

2. *Trade refuse* is the solid waste coming from commercial processes in factories and business establishments and includes steam ashes.

3. *Stable refuse*, or manure.

4. *Market refuse* is trade refuse chiefly made up of garbage and rubbish and is separately classified on account of its special qualities.

5. *House refuse* is chiefly garbage, ashes and rubbish from houses, stores, schools, churches and such other establishments as do not themselves dispose of the waste products of their own activities.

(2) Many of the materials which go to make up these different classes of refuse require no further definition. Such are snow, street sweepings, leaves and manure. However, on account of their great importance it is necessary to give closer definitions for garbage, ashes and rubbish. These have been defined satisfactorily as follows:—

Garbage is the organic waste matter, both animal and vegetable, coming from houses, kitchens, restaurants and hotels including the natural content

of moisture and the tin cans in which portions of the animal and vegetable matter have been contained.

House ashes may be defined as the residue from fires in houses, schools, churches, stores and small business establishments and also includes other inorganic materials such as glass, crockery, metallic substances, dirt, dust and bricks.

Rubbish consists of wood, paper, rags, bedding, excelsior, straw, leather, rubber, old furniture, boxes and barrels.

These materials as defined are classified in Fig. 1 which, with some modifications by the writer, was taken from "Municipal Refuse Disposal" by Mr. H. DeB. Parsons.

It would be advisable for the American Public Health Association to standardize these definitions and these classifications and to publish their standardizations in such form as to make them available for the use of all cleansing superintendents.

(3) Having defined the various kinds and classes of refuse materials it is necessary that the quantities in which they are produced should be determined. These quantities will vary from one locality to another depending upon the climate, the character of the people, the economic location, and the efficiency of the cleansing department. However, no records bearing on the quantities of refuse yield the best results unless they are arranged in all communities according to a standard form. An average daily quantity of refuse in yards and tons for the summer and winter for the separate materials such as garbage, ashes, rubbish and manure should be recorded. In order to make allowance for the difference in the number and character of the people these recorded quantities should be reduced to "Pounds per thousand population per day" and "Pounds per capita per year." It would be advisable to determine these last figures on the basis of 312 days per year.

(4) The proportions in which the various ingredients are found in refuse should also be determined for the different seasons and differing districts in any one community. Therefore, the data should be recorded showing the percentage proportion of garbage, ashes and rubbish in house refuse for each month of the year. Such data is of the greatest importance in the design of a reduction plant or refuse incinerator. Under this heading there should also be included the weight per cubic yard of refuse material recorded in such form as to show seasonal variations, and the differences due to the character of the population.

(5) Although less important than the quantities and proportions of refuse materials, the composition, nevertheless, in many instances has a controlling influence upon the design of the disposal works.

The composition of refuse may be determined by a physical or so-called "mechanical" analysis and by a chemical analysis. The mechnical an-

Fig. I.

Classification of Refuse Materials

- Municipal Refuse
  - Public Refuse
    - Animal Manure
    - Pavement Dirt
    - Snow
    - Droppings from carts
    - Waste building materials
    - Leaves
  - Trade Refuse
    - Dry factory waste
    - Steam ashes
    - Rubbish from office buildings and factories
    - Slaughter house waste
    - Cleanings from private catch basins
  - Stable Refuse
    - Straw
    - Horse Droppings
    - Cleanings from stables
    - Fly Maggots
  - Market Refuse
    - Garbage from markets
    - Rubbish from markets
    - Old boxes and barrels
  - House Refuse
    - Garbage
      - Animal matter
      - Vegetable matter
      - Moisture
      - Meat and bones
      - Fruit
      - Tin cans
    - Ashes
      - Coal
      - Dust
      - Glass
      - Crockery
      - Metallic Substances
      - Brick
    - Rubbish
      - Boxes and barrels
      - Wood
      - Paper
      - Rags
      - Beddings
      - Excelsior
      - Straw
      - Leather
      - Rubber
      - Old furniture

alysis shows for garbage, ashes, rubbish, etc., the percentage proportion of such materials as vegetable matter, bones, glass, paper, rags, metals, wood, dust, excelsior, crockery, etc. An analysis of this sort is useful in determining the quantity of salable material which can be picked out from the refuse. The chemical analysis should show for all classes of city refuse the percentage proportion: first of carbon, water, true ash and volatile matter; and second of water, grease, tankage, ammonia, potash and lime. The first analysis will show the value of the material analyzed for incinerating purposes. The second analysis will show the fertilizing value of the material, after the extraction of the grease. I have never seen any analyses recording the food value of refuse for disposal at piggeries. Tables for recording statistics of refuse materials in accordance with the above requirements were presented to this association by the writer at the annual meeting in 1911. If the data covered by these tables were available for a number of years from any particular community, they would furnish sufficient information for a thorough-going investigation with recommendations as to the efficiency of the existing methods of refuse collection and disposal; and for improvements should they be necessary.

The comparison by one cleansing superintendent of the data so gathered in his own community, with data gathered and similarly recorded from other communities, would serve as a valuable check upon the efficiency of operation of the local department.

Such data is scarce at the present time. It is hoped that these forms and tables for statistics will be arranged and brought into use by the American Public Health Association so that satisfactory data may be gathered for use in the future.

THE HOUSE TREATMENT OF REFUSE.

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Read before the Sanitary Engineering Section, American Public Health Association, Washington, D. C., September, 1912.

A recent article upon the handling of city waste says: "Investigations for municipal refuse disposal are commonly made to include, first, the collection, and second, the disposal of refuse. To these two lines of investigation, however, a third one should be added, namely, the treatment of refuse in backyards and alleyways."

The house treatment of municipal refuse is the first step towards final disposal and is the most important one. The educational effect of a proper system of house treatment can be made to influence the householder in the direction of improvement in a sanitary way along other lines. The fact that many complaints arise from the condition of the can itself emphasizes the importance of proper methods at the home. Garbage becomes a nuisance under certain conditions. These conditions are its composition, its moisture, the degree of exposure to air and to flies, the amount of mixture with ashes and other refuse, the character of the receptacle, frequency of collection, etc.

The composition of garbage is well known to be the animal and vegetable refuse arising from the operations of housekeeping. The moisture under ordinary conditions ranges from 80 to over 90 percent. It is now well recognized that flies breed in large numbers in decaying animal and vegetable matter as well as in manure. The amount of mixture with other forms of refuse depends upon the rules of the municipality regarding primary separation by the householder, and these are determined largely by the method of disposal. The character of the receptacle has progressed from wooden bins or boxes to pails and, finally, to metallic cans with metallic covers. Frequency of collection depends almost entirely upon the condition of the can—foul cans and frequent collections always go together. The method of disposal determines largely the size of the can, the amount of primary separation, the frequency of collection, and the amount of nuisance in the can itself.

Household separation varies from one can to hold all refuse to two cans, one of which is used for garbage and rubbish, and the other for ashes, tin cans, etc.,—or, in some instances, one for garbage, the other for ashes and all forms of rubbish, including paper, tin cans, etc.,—or to three cans, one for garbage, one for ashes, and one for rubbish.

The most important point to be attained should be an absence of any

nuisance about the home and about the can. This may be done by draining garbage of all moisture and wrapping it in paper before placing it in the can. This insures cleanliness in the home, in and about the can; also ease of handling, both in hot and cold weather; prevents the develpment of flies, and tends toward cleanliness all the way from the drain in the kitchen sink to the ash pile at the disposal plant. It is commendable also on account of the simplicity and ease of adoption.

By insuring a clean can that is without moisture, it makes for a clean back yard. As the back yard becomes clean, neat and without odor or nuisance, the next and most natural step is the planting of vines or shrubs, so that the can may be shielded from sight, so there can be no offense to the eye. Everything of waste being placed in cans and nothing thrown out, the alley soon becomes passable, and assumes the well-kept appearance of the street. It is assumed that the location of the can pertains to the collection part of this discussion. While the can remains on the premises, however, it should be at the back of the lot.

The garbage should not be mixed with ashes for several reasons; first, it is not necessary to collect ashes as often as garbage; second, in the majority of cities garbage and ashes require separate handling and a different method of disposal; third, garbage with its moisture when mixed with ashes will freeze in the can in the winter time, retarding collection and mutilating the can. The wrapping of garbage permits also of a clean method of handling household rubbish. The most important result, however, of proper separation, draining and wrapping, is the educational effect upon the householder. The lessons of "contact," "fly-infection," "rat-breeding" and other up-to-date sanitary teachings become easy and are readily learned and adopted.

Rubbish should be kept with dry wrapped garbage, or if collected separately, in a gunny-sack within a can, the sack to be tied and removed, and an empty sack put in its place.

Ashes should be kept in cans together with the broken glassware, tin cans, etc. The size of the cans for garbage, rubbish and ashes varies with the frequency of collection, and ranges from ten to thirty gallons.

Manure should be kept in water-tight, screened boxes or pits, and removed within the incubation period of the fly.

The whole object of the house treatment of refuse should be to avoid nuisance or offense to the eye or the smell at the house; to minimize nuisance and expense in the service of collection; to fit into a system of disposal that shall be without nuisance, in fact, to have no nuisance at any point; and to educate the householder in habits of cleanliness. In these days of sleeping porches, lawn tents, and open air living, isn't it worth while?

COLLECTION OF MUNICIPAL REFUSE.

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Read before the Sanitary Engineering Section, American Public Health Association, Washington, D. C. September, 1912.

The collection of muncipal refuse is one of the most important parts of the general problem of refuse disposal and should be so considered, instead of as a problem by itself. It affects a larger proportion of the population more directly than do the works for the final disposition of the refuse, and the cost of collection is frequently more than the cost of the final disposition. The financial aspect of collection is often looked upon as the most important, and while it is of great importance, still, due consideration should be given to the sanitary and æsthetic sides of the question. The relative importance of each will depend upon local conditions.

The treatment of the refuse at the house should, first of all, be consistent with cleanliness, as nuisances in yards and alleys may affect more people than either the collection or the disposal of the refuse. It should be simple and easy of adoption and should favorably affect the cleanliness and economy of the collection system.

There are advantages in having a standard type or types of receptacle for an entire city, the number of types depending of course on the nature of the collection, whether separate or combined, but this is not essential. The receptacle should, however, be of durable material, should have a tight fitting cover, and, in general, its weight, when full, should not be greater than that which can be handled by one man. If receptacles holding garbage or other refuse containing a large amount of water are kept in covered, lined pits below the surface of the ground, their contents are not likely to freeze in winter. There is a further advantage with this arrangement in that the collector can find the receptacle quickly and easily. Again, there is less chance of the receptacle being stolen. With night collection, on the other hand, it may be found desirable to have the receptacles placed at the street line.

At Minneapolis, Minn., it is said that the wrapping of garbage in paper prevents objectionable odor, keeps away the flies, and in winter prevents the garbage from freezing and adhering to the receptacle.

The frequency with which refuse is collected will depend on local conditions, character of refuse, climate, and method of collection, and will often vary with the season. In any event the refuse should be removed from the premises before it accumulates to the extent of becoming a nuisance.

In some American cities, especially in the congested portions, garbage is removed daily. At Columbus, Ohio, it is collected twice a week in summer and once a week in winter, and at Minneapolis, where the garbage is wrapped in paper, once a week at all times of the year has been found sufficient. In Boston, Mass., and Rochester, N. Y., ashes are collected once a week, and in the cities in England and on the Continent, where the garbage, ashes and rubbish are collected together, collections are, in general, made three times a week.

The length of haul depends on many factors, important among which may be mentioned the topography of the city and the location of the disposal works. At Columbus the long and short haul system has been adopted each team traveling the same total distance each day, about sixteen miles. In other cities, among which are Atlanta, Ga., and Seattle, Wash., it is being found desirable to provide loading stations throughout the city, to which the refuse is delivered by the collecting wagons and from which larger vehicles transport it to the point of disposal.

The question of collecting refuse at night instead of during the day should also receive consideration. Its advisability depends largely on local conditions and may vary even in different sections of the same city. In Milwaukee, Wis., it was adopted in order to lessen the nuisance from odor and dust. In Cologne, Germany, it has been abandoned because of the noise made by the wagons during the hours when people wished to sleep.

The relative merits of the separate collection of each class of refuse or the combined collection of all classes, *i.e.*, ashes, garbage and rubbish, should receive careful consideration, but the system to be adopted must, of necessity, depend on the method of ultimate disposal.

The separate collection is now in use in many American cities, particularly at those places where the garbage is disposed of by the reduction method, and in some cities, where there is a large foreign element in the population, it has been found difficult to get a complete separation of the several classes of refuse. Separate collection will be found in many instances to be less convenient at the house, more complicated and more expensive than the combined collection.

The combined collection of all classes of refuse will usually prove to be cleaner and to have fewer objectionable features, and with this system it should be easier to secure and keep a better grade of employees. The mixing of garbage with the rubbish and ashes will prevent, in a large measure, the blowing around of the latter, will lessen the dust nuisance, and indirectly may lessen the cost of street cleaning. The decomposition of the garbage is far less noticeable and, from the point of view of preventing a nuisance, the receptacles and wagons will not require such frequent cleaning nor would it be necessary to collect the refuse at such frequent intervals.

The fly nuisance is also reduced to a minimum and there is less likelihood of odors if the refuse is stored pending its final disposition. As but one type of wagon is required the system is probably easier to adopt and easier to enforce, fewer regulations being necessary. On the other hand, its adoption may in certain cases increase the cost of ultimate disposal. Where the refuse is incinerated, for example, it may be more expensive to burn all the ashes with the garbage and rubbish than simply to burn the garbage and rubbish with enough ashes to produce proper incineration, and dispose of the remaining ashes otherwise. The combined collection is now in use at Seattle, Wash., West New Brighton, New York City, and Atlanta, Ga., as well as in other American cities.

It is possible that it may be found advantageous, in some cities, to adopt the combined system of collection in certain districts and the separate collection in other districts, depending, of course, on local conditions.

The type of vehicle best suited for collecting refuse depends on the method of collection and other factors. Consideration should be given to ease of loading, emptying and cleaning, to provision against leakage, dust, odor and general unsightly appearance, to the question of noise during loading and when in motion, and to durability, first cost and cost of maintenance. The capacity of the vehicle is influenced by the length of haul, the frequency of collection and the topography. The garbage wagons at Columbus and Minneapolis hold 1.3 and 2 tons, respectively. At Seattle, where ashes, rubbish and garbage are collected together, the new wagons hold five tons. Properly arranged canvas covers have been found, in some cases, to have advantages over covers of wood or metal.

In New York City, where refuse is collected separately, a new type of collection vehicle is now being tested. The body is swung low on the running gear, with dumping ledges three feet six inches above the pavement, and is pivoted at one end to facilitate dumping. It holds nine cubic yards and is divided by a cross partition into two compartments, one for ashes and one for garbage. The relative capacity of the two compartments can be varied, by shifting the partition, to meet the seasonal variations in the quantity of each class of refuse.

At Zurich, Switzerland, the collection vehicle consists of three large, covered boxes set on a common running gear. After filling, the wagon is hauled to the incinerator where the boxes are lifted by a crane onto the automatic charging apparatus, the refuse dropping through the bottoms of the boxes into the furnace. By this arrangement the refuse is not exposed after it has been dumped out of the house receptacle and into the boxes of the collection vehicle. In Hamburg, Germany, electrically operated automobile trucks have been in use for a number of years. They cost about $3,800 each, weigh 11,000 pounds and hold three tons. Each truck is operated by two 4½-H.P. electric motors, the storage batteries

being recharged every day. One truck averages four trips in eight hours and covers a total distance of about thirty-five miles. The operation is very simple, one man being necessary to run the wagon and make the collections. The body is separate from the truck and, when full, is lifted by a crane at the incinerator and emptied into the storage bins. The cost of operating these trucks, exclusive of labor, superintendence and fixed charges, is given as $9\frac{1}{4}$ cents per mile or 27 cents a ton, a little less than half of the total being for tires.

Motor trucks for refuse collection are also being used in the United States. In Atlanta, Ga., for example, gasoline driven trucks, holding $1\frac{1}{2}$ and 3 tons each, have been employed for more than a year. The chassis costs $3,750 and the body of the wagon about $100. These trucks have proved very satisfactory, making six to eight trips a day and covering twenty-five miles. Each truck has a driver and two helpers, the former receiving $16 and the latter $9 each per week. At Seattle, 5-ton gasoline-driven trucks are being used with success to haul refuse from the loading stations to the point of disposal.

Information of value relative to the cost of collecting refuse is not easily obtainable, one of the reasons being that distinction is seldom made between the cost of collection and the cost of disposal. This is unfortunate, because the cost of collecting refuse is a very large part, estimated at 85 percent. in Seattle, of the total cost of collection and disposal. Cost data should be complete and due allownace should be made for proper interest charges on all capital outlay for equipment and other items.

The cost of combined collection at Seattle varies from $1.84 to $2.84 per ton, exclusive of superintendence and fixed charges. Superintendence amounts to 15c per ton. The net cost of incineration of the refuse is reported as only 52c to 70c per ton.

In Columbus, the cost of labor, equipment, repairs, inspection and superintendence for the collection of garbage amounts to $1.60 per ton, which, with fixed charges of 50c per ton, make the total cost of collection $2.10 per ton. The cost of collecting rubbish, exclusive of fixed charges, is reported as 54c per cubic yard, or, on the basis of 250 pounds per cubic yard, $4.32 per ton.

In Boston, Mass., in 1907, the cost of collecting ashes by the city is reported as $2.30 per ton-mile, exclusive of fixed charges, and for collecting garbage $2.18 per ton-mile.

The cost of collecting garbage in Minneapolis is said to be about $1 per ton, and in Atlanta the cost of collecting mixed refuse is estimated at $1.12 per ton. Pittsburgh spends $3 a ton for collecting and disposing of its rubbish and pays a contractor $2.25 per ton for collecting and removing its garbage.

The cost data cited give a general idea of the expense of collecting refuse

in several cities, but without an accurate knowledge of local conditions they cannot be safely used as a basis for estimates in other municipalities.

City ordinances and regulations relating to the collecting of refuse should be definite and consistent with each other, and there should be no uncertainty as to which department of the municipal government is responsible for their enforcement. A point of considerable importance and one which should be made clear in the city ordinances, is whether the occupants of property, or the property owners, shall be held responsible for the proper treatment of the refuse at the house.

As a general rule, the best results may be expected from municipal ownership and operation of the collection equipment. If the work is done by contract the regulations regarding collection should be strict and well enforced. In any case the collectors should be well-paid men who will take some interest in their work and, where possible, one man should always have the same route, so that he will become acquainted with the district and the house holders.

It will often be found advantageous, especially at first, to have district foremen whose duty shall be to inform the residents regarding the municipal ordinances and regulations and to generally improve the service.

SYSTEMS OF COLLECTION AND DISPOSAL OF GARBAGE IN CITY OF NEW ORLEANS.

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Read before the Sanitary Engineering Section, American Public Health Association, Washington, D. C., September, 1912.

The city of New Orleans is divided into seven municipal districts,[1] each district is divided into wards and each ward sub-divided into garbage collection districts. To each of these garbage collection districts the Department of Public Works assigns one of its garbage collection carts. These carts are the one-mule, two-wheel kind, with a capacity of 1½ cubic yards and are kept busy collecting garbage from 7 o'clock a.m. to 5 o'clock p.m., or until such time as it will take to collect all garbage.

These carts serve approximately 74,600 families and haul on an average a distance of one and one-half miles to the dumping ground.

Kitchen refuse is collected daily with the exception of Sundays and Thursdays. Thursdays are set aside for the collection of dry matter, such as broken crockery, glassware, tin cans and ashes.

All garbage collected throughout the front section of the city is hauled to garbage stations located along the river front at five different and easily accessible points, dumped into steel garbage cars and thoroughly disinfected after which a tarpaulin cover is tightly drawn over the cars to prevent unpleasant odors from emanating while passing through the city. These cars are hauled away at night by the public belt railroad to what is known as the "inter-change." From the interchange they are taken by the New Orleans and North Eastern Railroad Company to what is called the main dump, a very low and swampy place located in the extreme rear of the city, where the garbage is emptied and spread by the employes of this department, the process of which is very interesting and is as follows: On arrival of the large cars on the main track the garbage is dumped into smaller cars on a portable track. These small cars are drawn by a gasoline engine out on this extension portable track and emptied. This track extends about 800 feet on each side of the main track, or trestle. To prevent congestion alongside of main track of garbage not placed in smaller cars the department has a steam digger employed to remove this surplus. This digger is worked by means of a derrick and orange peel bucket, picks up the garbage from alongside of the track, or trestle work, and empties

[1] Area covered daily by garbage carts, 35 square miles.

it out into the swamp, a distance of about forty (40) feet from the trestle work. This dump is also equipped with an electrical pump for the purpose of flushing cars after they are emptied.

The garbage which is collected throughout the rear section of the city is hauled to different dumps located in the extreme rear of the city and accessible to carts. These dumps, of which there are eleven, consists of old unused drainage canals and swamp lands.

To dump in these low places and canals the sanction of the City Board of Health is obtained, and by the use of powerful disinfectants in a liberal manner, fermentation is prevented and the garbage rendered odorless and harmless.

Through the dumping of garbage into old unused drainage canals and low places, leveling same and surfacing with city waste, manure, street sweepings and street pilings, many of these low places have been transformed into beautiful parks, healthful playgrounds for children and good streets, all of which is a big asset to a city.

THE DISPOSAL OF MUNICIPAL WASTE BY THE BURIAL METHOD.

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Read before the Sanitary Engineering Section, American Public Health Association, Washington, D. C., September, 1912.

The city of Davenport, Iowa, with a population of approximately 45,000- lies on the west bank of the Mississippi River, with its business and manut facturing districts in the valley, and its residential district on the adjacene bluffs, tlfe latter at a distance varying from one fourth mile to one mil, from the banks of the river.

Up to the season of 1910 the city disposed of all its garbage and night

Fig. 1.—Showing wagon dumping over face of bank and piles of covering material on either side.

soil by means of the simple, economical and rather primitive method of dumping in the river and allowing the current to carry the deposits away.

A dock barge and a hopper bottom barge equipped with flushing pumps and a gas engine winch was used. The garbage wagon drove directly on to the hopper barge and dumped by gravity through traps into the hopper. Twice a day this barge was worked out about 1,000 feet from shore by means of a chain, anchored at each end and passing through the winch on the barge. When out to a point where the river was deep and the current swift, the hopper bottom was sprung and all refuse released and allowed to either sink or float away down stream. Fortunately, the general set

of the current tended to prevent any offensive matter from depositing on the bank of the river within or adjacent to the city limits.

During that portion of the year when the river was frozen over, the garbage was hauled and dumped upon the ice and carried away in the spring; this period ordinarily lasted from about January 1 to February 26.

Early in May of 1911, the War Department of the United States government notified the city to cease, within ten days, dumping all refuse in the river. Hurried meetings were held, and after numerous consultations and investigations the writer advocated a trial of the burial method of disposal. Mr. John W. Alvord was employed to make a report on the most feasible and economical method of handling this question and his report recommended a thorough trial of the burial method.

Fig. 2.—Covering garbage. Retaining wall partially completed.

The city is reclaiming and filling out the river front, known as the levee, to a line established by the War Department in 1893, known as the Harbor line. This line is from 175 feet to 600 feet out from the present shoreline. It was determined to try the burial method at this point where the retaining wall for the work was practically constructed, and to so utilize our disposal method to help in making the fill for reclaiming this territory. The city is divided into seven collection districts, each of which is served by one tight covered metal wagon, with a capacity of 1½ cubic yards. All garbage is deposited by residents in metal cans with tight covers, placed on alley lines. These wagons collect all garbage except from hotels, restaurants, groceries and wholesale houses, at no cost to the tenants or property owners. The exceptions noted are forced to care for the hauling of their refuse matter themselves. One barrel wagon cares for the

cleaning of vaults, night soil, etc., at a certain fixed charge per cubic foot removed.

During the months of July and August of this season, the seven city wagons delivered to the burial ground an average of 710 cubic yards of garbage per month; the wholesale houses, etc., delivered an average of 333 cubic yards per month, and the night soil wagon averaged 126 cubic yards per month; a total of 1,169 cubic yards of refuse delivered and covered. This covering was accomplished with one foreman and three laborers, at a monthly cost of 18.2c per cubic yard. This figure is based on our maximum conditions, so that during a large part of the year when the quantities are much less, the labor charge per cubic yard will run as high as 35¢ per cubic yard, with a fair yearly average, based on the past two seasons, of 28¢ per cubic yard.

Fig. 3.—Showing condition of garbage bank before mattress protection was placed. Nuisance was intolerable this day.

To cover this refuse, the city has concentrated the dumping of all available material at this point—cellar excavation, ashes from alleys, street sweepings, material from paving and sewer work in the vicinity, have all enabled us to provide ample covering material without additional cost to the city. At intervals, however, during the late fall and winter, we have been forced to purchase some sand—if much of this were to become necessary, our burial proposition would be too expensive, but so far the cost has been small.

The method so far pursued, has been to work over the face of the bank fill, which is about eight to twelve feet high. The wagons are backed to the edge and dumped automatically over the edge. As the slope of the bank is about 1½ to 2 to 1, the refuse requires very little raking to spread over the face in a thin layer. Piles of covering material are always dumped

along the top of this bank so spaced that there is just room between piles to back in the garbage wagon. As soon as the wagon pulls out, two men with long-handled shovels spread the covering material from the two adjacent piles upon the freshly dumped refuse.

In ten minutes the garbage is covered to a depth of from six to ten inches. This has been found sufficient for immediate protection and during the day more is added as the opportunity offers, until from twelve to sixteen inches of covering is placed by night. One advantage of working over the face of the bank is that all surplus moisture drains out of the garbage into the water of the river so that less covering material is required and a firm, more stable fill is obtained.

Only at times of a high stage of the river has any serious trouble been encountered. At such times, the wave action and current have seriously

Fig. 4.—Same bank as Fig. 3 after protection. No odor.

cut into the fresh bank and caused an intolerable nuisance. In 1911 we were forced to place a mattress protection to prevent washing out and to move to the high level bank until the water receded. These mats were made of ordinary chicken wire fencing, six feet tide and fifteen feet long—two thicknesses of wire with about ten inches of old hay between, all tied and laced with marlin. These were hastily thrown together, hung over face of bank and weighted with riprap. The wash of the bank and silt of river sealed these mats at once and completely stopped the cutting away of fill and prevented any further nuisance.

Since the retaining wall on the Harbor line has been constructed to such a height that there is no danger of the river getting at our bank, we have had no trouble whatsoever with our disposal methods and complaints of odor or any nuisance are almost unheard of. As the disposal grounds

are not over 600 feet from the business district, we think that we have attained a very fair degree of success with our method.

In addition to satisfactorily disposing of the refuse question for years to come, the use of the method during 1911 alone, caused to be deposited in our levee some 50,000 cubic yards of material, a large part of which would hitherto have been scattered all along the river and largely wasted. The land which this fill is reclaiming, is worth to the city, at a conservative estimate, $35,000 per acre. By the end of 1913, we will have an eight-acre tract reclaimed at the present dumping ground, largely by the burial of garbage—the only cost to the city being that of the retaining wall. We have found that it requires about two cubic yards of covering material to effectively cover $1\frac{1}{2}$ cubic yards of garbage or night soil.

The attached photographs will give an idea of the methods used and general conditions at the disposal ground.

GARBAGE PIGGERIES.

ALVAH W. BROWN,
Owner, Pig Farm, Grand Rapids, Mich.

Read before the Sanitary Engineering Section, American Public Health Association, Washington, D. C. September, 1912.

I have been requested to write my thoughts regarding the disposal of garbage, by feeding same to swine, by Mr. Greeley and he sent me a schedule of several printed forms to govern my delineations; but as I am merely a practical man at the disposal end, I must write according to my own ideas, otherwise I would become hopelessly entangled and perhaps utterly fail to give you my version.

For a term of five years I served our city in membership on the Board of Police and Fire Commission and that put me in contact with city departmental troubles, one of which was the great expense to which our city was enforced in the disposal of its garbage by incineration.

We have a city of about 120,000 population and the collection of its garbage, at the time my interest dates, was being made under the supervision of a contractor who had authority as sole collector with the privilege of charging families from 40¢ per month upwards for the collection of garbage; this method did not appeal to the citizens from a sanitation standpoint, because a family engaging the services of the collector might have a neighbor on either side who was disposing of his garbage in an unsanitary manner in an effort to avoid the expense entailed through the city's plan. The general demand was for municipal collection so the burden might be spread over the taxpayers in general, thus encourage each and every family to employ the collection service that might be installed under such a system. The city advertised for bids for the disposal of its garbage with the proposal that the municipality engage in the collection to cover the entire city, the expense to be borne by a fund derived through general taxation.

The facilities of the city being inadequate for destroying its entire collection by fire, the authorities were anxious to find means more economical if possible, to the desired end.

I began an investigation of the methods that were employed by various cities throughout the country, my research being wholly of a nature to determine the most profitable system for a contractor and our city to adopt.

My travel in investigating various methods has covered cities ranging all the way between Los Angeles, Cal., and New Boston, N. H., both terminal points at the time of my visit being the location of pig farms. I con-

cluded that in order to produce a revenue for a contractor in disposing of garbage by reduction process, it would necessitate the payment of a contract sum by the city. It was my judgment that the burning of garbage was less desirable from the contractor's and city's standpoint because of the enormous expense entailed and the slight value of receipts resulting through such operation. My conclusions were, that the disposal of garbage on a pig farm was the only system that might be acceptable to my city, after reviewing the profits that might accumulate to the contractor through such a method.

I concluded to visit every pig farm of consequence disposing of municipal garbage and my research was quite complete. I found the plant in New Boston the most sanitary of any visited but the volume of business done at that plant was limited and the plans effective did not meet with my approval, as the expense in its conduct was too great. The pig farms

at Worcester, Mass., and St. Louis, Mo., I found to be the largest and the most practical from a contractor's standpoint, but the last named plant was entirely too unsanitary to furnish any guiding line; from the Worcester plant I got the best ideas for a large industry, but concluded to establish more along the lines of the New Boston plant for sanitary arrangements.

After arriving at these conclusions I made the purchase of a sandy farm of one hundred acres on a railroad about five miles from the center of our city and proceeded to the establishment of a plant along the lines that were not presented at any industry I had visited and the illustration accompanying will give a better description of what I have developed than I can present through explanatory paragraphs. I am sending fifty illustrations of my plant, so they may be distributed among your members and more will be furnished upon application.

My contract with the city provides that the municipality shall collect the garbage from all families requesting collection service not less than

twice each week, and the material is to be deposited in my cars, four of which I furnish of a water-tight, gondola variety, without recompense to the city. For the disposal service I receive nothing; the material I am to accept of is defined as meat, fish, fruit and vegetable refuse, liquid or otherwise, and all tin food cans. The contract specifically states that no dish water, sweepings, glass, lawn rakings, manure, ashes, papers nor other refuse shall be intermixed with the material collected.

The city was to prevent the collection of garbage by individuals who aimed to dispose of same in their own way and represented in the advertisements for bids, that it would be the sole collector and the contractor would receive all the garbage from families, hotels, restaurants and commission houses.

About seventy tons are being collected through the months of July, August, September and October; in May, June and November about fifty tons are collected daily; through the other months the collection will average between thirty-five and forty tons per day.

I am obliged to pay the freight from the loading station of the city to my farm, one car of which is sent every weekday, and during the period of four months covered by the seventy-ton daily collection two cars per day are shipped occasionally, in order that the accumulation is taken care of.

These cars, as the illustration indicates, are switched on to my farm siding and are hauled through my buildings by cable power which is of the windlass or capson variety, a horse being employed as the motive. The car travels slowly and six men are placed in same for pitching the garbage on both sides of the track on the concrete platforms from which the swine are excluded during the feeding process. As the car passes each compartment, the swine are admitted to the feed until the entire length of about one thousand feet of trackage has been traversed; feed for the buildings containing swine, not adjacent to the side track, is delivered by wagons; the garbage deposited in the detached buildings is not of a great volume beause they contain sows with their litters which do not require a great amount of garbage as they are fed buttermilk and meal in addition to the other. All buildings are built on a plan so that team and wagon may be driven lengthwise through the center for feeding and cleaning conveniences. All buildings have smooth concrete floors for sanitary reasons and such a floor also furnishes ease for cleaning on account of there being no interruption in the scoop of the shovel as nail heads and unevenness in board floors provide. Each of the three farrowing buildings numbered 3, 4 and 5 in the illustration, are twenty rods long, thirty feet wide and contain one hundred and twelve compartments and litters. Each compartment is six by twelve with a yard six by sixteen adjoining each compartment. So little garbage is fed in these that it was not thought advisable

to arrange them on the railway siding as the building expense would be greater on account of the twelve-foot width of center aisle necessary for a railway car, whereas a team and wagon pass through a six-foot aisle.

Buildings marked 1 and 2 through which the railway cars pass are partitioned into stalls varying from twelve to thrity-six feet in frontage on the aisle or track; these are of various sizes because of the necessity of having stock of different ages in proper numbers to insure thriftiness. It is especially necessary that young, newly-weaned pigs be kept in small numbers which I could satisfactorily explain to any interested party. When the pigs get to a size of one hundred pounds or more, a greater number may safely be kept together; as an example, I frequently have from four to five hundred brood sows in the same lot and sleeping quarters in the winter, whereas one quarter of that number of weaned pigs running together would mean positive loss by death in great numbers.

The buildings through which the railway cars run have a concrete feeding platform on each side of the track nine feet in width; beyond these are the sleeping and roaming quarters. The concrete feeding platforms have gate partitions between each bunch of swine that may open, thus allowing teams to drive the entire length of said buildings on either side of the track for cleaning purposes very morning after the hogs have had all the opportunity to be allowed for eating from the previous day's deposit. The food that is placed on the platform in the forenoon of today is gone over by the swine confined thereon until five o'clock. Then they are closed into the sleeping and roaming quarters and the gates dividing the feeding platforms are all thrown open, this allows from six hundred to one thousand brood sows and store hogs to have access to the feed that has been previously gone over by the hogs confined. Tomorrow morning the brood sows will be driven from the feeding platforms and the wagons follow in for cleaning purposes. The brood sows acting as night scavengers on the platforms are those whose pigs have been weaned, a large number of which we constantly have on hand. This system gives the first chance at the food to the pigs and fattening stock confined in the building and the brood sows act as a supplementary clean-up brigade who work all night if their appetites so incline them.

As the wagons pass down the concrete feeding platforms on either side of the track every morning the first wagons through carry away tin cans, glass and other rubbish that is not suitable for depositing in the compost heap; following these is a wagon which carries away the bones; then come the wagons into which the sleeping quarters as well as the feeding platforms are cleaned and these loads are hauled to the compost heaps and the material is confined in a way to prevent the least possible escape of odors from the action of decomposition which ensues and makes the material very desirable for land fertilization as the crops on my farm and

others in the vicinity indicate. This is hauled out on the land in the winter time when teams are most apt to be idle, but more or less is taken away through the summer months. The detached buildings are also cleaned in the same manner.

My farm is almost entirely devoted to the raising of corn which is harvested when the kernel is just passing into the dough state. This is run through an ensilage cutter and cut into lengths about three quarters of an inch long and elevated into silos numbered 15 and 16. As we do not get a carload of garbage on Sunday, one of our cars is placed between the silos and sufficient quantity of ensilage is taken out to feed that day all along the track and the other buildings are fed with the same material including buttermilk and meal by wagons. In feeding ensilage but one day each week, the swine have quite a relish, not only for the grain, but for the finer part of the stalks and leaves, but there is more waste in feeding ensilage to hogs than to cattle. My silos are each sixteen by forty-two feet inside and are wholly of concrete including the roofs and each holds about two hundred tons.

Number 17 in the illustration represents our concrete water tank which holds two thousand barrels and is on the highest elevation of land on the farm which is forty-nine feet above the creek nearby from which water is elevated by a hydraulic ram located below a concrete dam in the creek. We found this did not furnish ample supply and a steam boiler and pumping equipment is located near by to fill the tank as occasion requires. This tank furnishes a good pressure of water which is piped under ground to the buildings, yards, stable and lawn and a good wholesome quality is provided; in many of the yards are located automatic drinking fountains that need but little attention,

Building marked 17 encloses six large concrete boiling tanks each four feet deep, six feet wide and twenty-four feet long; in these tanks is a system of steam pipes that cooks the garbage after water has been added and grease is taken from the top after the process has been completed; the garbage is then allowed to flow into other tanks for cooling and storage. The cooking process is not followed in the summer as the vegetable substance in the garbage so largely predominates in volume that it absorbs so large a percentage of grease from other substances that cooking is thought inadvisable. Aside from this, vegetable matter such as melon and fruit offal is made less valuable as food for swine in being cooked, but in the winter time the volume of garbage is decreased and the per cent. of grease to the ton is greater and it also puts the frozen portion in more palatable condition and enables us to feed warm slop to young stock. Our cooking tanks are elevated and so arranged that the cooked garbage flows from one tank to the other and eventually in the wagon tanks and tramway cars for distribution among the swine.

Building 6 is our blacksmith shop where our repairs are made and the shoeing of horses attended to. To handle the work at our plant, fourteen horses and twenty men are employed nine hours per day; we use bottom dump wagons entirely for our cleaning and these are drawn up an elevation by cable power over the compose heap which is surrounded by concrete walls and there deposited, thus avoiding all the manual labor possible.

This farm has been established less than six years, and previous to that time industries of this character have been of a very hazardous nature because of the great risk of loss of stock through the ravages of hog cholera. Since the government process of hyper-immunization has been perfected, this disease can be controlled with slight losses if the rules are systematically followed. Cleanliness is essential from a sanitary standpoint, but the lack of it has apparently no effect upon the prevalence of cholera in event the stock has once been made immune. The pigs are treated at the age of from four to ten weeks and while nursing; a pig is held in position by one man and by hypodermic, virus is injected in the inside of the left ham which furnishes the disease germ; serum is injected into the right which furnishes the combative qualities in the pig's system; this is known as "the simultaneous treatment" and is not always practical because of the danger in handling the virus on the part of the operator. My losses in pigs from this treatment in the summer months will not average above five per cent., but in the other months which are not so favorable to the pigs, the losses are considerably greater and the per cent. depends on the weather conditions. I treat pigs at this age because of the lesser amount of material required as this is regulated by the avoirdupois of the animal. Another reason is that all our stock must be immune, otherwise the animals are quite sure to contract the disease early in life. If any animals are to die through vaccination or through the disease we want it to happen while they are young and before any investment of consequence in their development has been occasioned. My experience indicates that treatment by this process makes the animal immune during its natural life which does not often exceed four or five years and is generally much less. My pigs being from immune sire and dam makes them less susceptible to the disease if not vaccinated and less liable to death through the vaccinating process. It has been estimated that pigs from stock where immunity extends back several years on both sides have about 40 per cent. of immunity even though no treatment is given and I believe this is a fair estimate.

A large part of my sales are of pigs and mature breeding stock that go to garbage disposal plants and the farmers, where cholera has prevailed to an alarming extent. I have furnished foundation stock to a number of garbage disposal industries, not only because of being able to provide cholera-immune animals, but because it is necessary that such plants be stocked with swine that have been accustomed to the character of food

to be provided. If a garbage plant is stocked with farmers corn- and grass-fed hogs there will be a greater loss by death then if they are wholly raised on garbage feed. I know this to be true from the statements of others and I have had expensive experience along the same lines and before I could establish a successful herd I found it necessary to buy this very class of animals.

Another trouble which is generally met in enterprises of this character is through the fact of the establishment of unsuitable feeding and sleeping quarters for the stock and the lack of the right kind of soil. Our buildings are well constructed and permanent which makes the business not only more profitable, but greater satisfaction through the conduct of the business is derived. At this writing I have 5,860 swine at my plant and they are confined to about twenty acres of land; my herd sometimes runs above six thousand, but in winter I shall aim to reduce the number to about four thousand.

The city owns the wagons and horses used for the collection and the men are hired by, and under control of the Board of Health. At this time fourteen two-horse wagons and three one-horse wagons with covered steel tanks are collecting from 19,012 families twice each week and from sixteen hotels and thirty-nine restaurants daily, with two men working eight hours on each wagon.

We do no slaughtering at the farm, but have facilities for loading stock, bones, grease and fertilizer in carload lots. Fat hogs are finished on corn and mill feed.

From the city's standpoint of economy and the contractor's ambition for revenue, I am satisfied there is no system of garbage disposal that will meet the requirements so completely as that which is effective in Grand Rapids, and for endorsement of this statement I respectively refer you to the city authorities here.

I would welcome a visit to my plant by any interested parties.

DISPOSAL OF GARBAGE BY THE REDUCTION METHOD.

IRWIN S. OSBORN,
Engineer in Charge Refuse Disposal, Columbus, Ohio.

Read before the Sanitary Engineering Section, American Public Health Association, Washington, D. C., September, 1912.

The disposal of garbage by the reduction method was first introduced in the United States at Buffalo, N. Y., in 1886. The plant installed at Buffalo was known as the Merz process and the disposal was made by placing the garbage in dryers so as to break down the material and drive off the moisture, after which the solids were placed in extractor tanks and the grease recovered by means of a solvent, such as benzine and naphtha.

Since the installation of the first plant at Buffalo, reduction plants have been constructed in the majority of the larger cities of the United States.

The plants operated at the present time by what is known as the Merz process differ from the first installations in regard to the manner in which they are operated. In the first installations of the Merz process, the garbage was placed in steam jacketed dryers which were expensive to operate and necessarily slow in drying on account of the low temperature. In the present plants of the Merz type the garbage is first crushed or disintegrated and then passed through continuous direct heat dryers, so that the garbage comes in direct contact with the combustion gases and is dried while passing through the dryer.

A few years after the installation of the first plants of the Merz type, plants were installed at Cincinnati, Ohio, and Providence, R. I., which used what is known as the "Simonin Process."

In the plants of the Simonin type the garbage was reduced by placing it on to small cars built up with shallow trays which, when loaded, were run into extractor ovens, consisting of large iron shells six feet wide by eighteen feet long, where it was treated with hot naphtha and naphtha vapors under pressure for a period of twenty-four hours. The grease united with the naphtha and dropped to the bottom of the extractor shell and was drawn off and separated by distillation. After the recovery of the grease, live steam was turned into the shell to remove naphtha before removing the material. The plants using this method were operated for a few years, but were finally abandoned or replaced with other methods due to the losses of solvent and excessive cost of operating. Considerable complaint was made over the odors given off at the time the extractor shells were opened.

The first plant in which the garbage was sterilized with steam, or cooked in closed tanks, was installed at the foot of Capitol Street, Washington,

D. C., in 1892. The plant was operated but a short time when it burned down and was never rebuilt.

Following the installation of the plant at Washington, plants were constructed at Philadelphia, Boston and New York, using what is known as the Arnold-Edgerton system.

A large number of patents have been issued for garbage reduction machinery and equipment and several processes installed under various names such as Merz, Simonin, Chamberlain, Holthaus, Edson, Arnold-Edgerton, Flinn, Wheelwright, Weislogle, etc. The plants installed under the various names differed in detail as to the manner in which they were operated to correspond to the ideas of the designer or to meet the local conditions.

The reduction of garbage consists in the breaking down of the material by means of heat and the recovery of the by-products, which have a market value. The work can be accomplished by cooking in open kettles and skimming the grease off by hand, by drying and extracting the grease by means of a solvent, or as is done in the more modern plants where the cooking method is used and the work done in closed apparatus which is mechanically operated.

At the present time garbage is usually reduced by one of two methods and for distinction all the plants operating can be considered as using either the drying or cooking method.

The two methods might be described as follows:

1. *Drying method.* The drying method consists in crushing or grinding the crude garbage and passing it through direct heat dryers to drive off the moisture and break down the cells. The dry solids are then placed in extractor tanks and the grease recovered by percolation using gasoline as a solvent.

2. *Cooking method.* The cooking method consists in placing the garbage in digestor tanks where it is cooked and then exacting the free grease and moisture by pressing. The solids from the presses are then dried and in the more modern plants the dried tankage is percolated to recover the grease that is not extracted by the presses.

The relative advantages of the two methods give rise to a difference of opinion, although at the present time the majority of plants are operated by the cooking method. The advantages and disadvantages of the two methods might be summed up as follows:—

Advantages of Drying Method:

1. The first cost of the plant is less, due to the equipment and building space required.
2. The operating costs are less, due to the amount of labor and power required.

Disadvantages of Drying Method:

1. Carbonizing of the grease in the dryer, due to the high temperature required so that the maximum amount of grease is not recovered.

2. The material is not broken down so that solvent will act as readily on the grease particles to allow maximum recovery.
3. The mechanical condition of by-products is not as desirable without additional treatment.
4. There is a greater volume of gases to be deodorized, making it difficult to deodorize the same economically.

Advantages of Cooking Method:

1. The cells of the material are more completely broken down so that a larger amount of grease can be more readily recovered.
2. All material is enclosed during the process, so that the gases are more readily deodorized with a less volume to be deodorized.
3. In the modern plants the mechanical condition of the by-products is better.

Disadvantages of Cooking Method:

1. Increased first cost of building and equipment.
2. Increased operating cost.
3. Increased maintenance costs.

The by-products produced by either method have the same relative market value. In plants that have been operated by both methods the experience has been that the additional amount of grease recovered by the cooking method has more than offset the increased costs and at the same time the odors were eliminated to a larger extent.

The criticism of reduction works has been due to the manner in which works have been constructed and operated and the same criticism will continue as long as the work is done by contract without restriction as to the manner in which it is to be done. It is only natural for a contractor, who obtains a contract in competition without restrictions, to conduct the work at the least cost with the largest renumeration possible. The result will be inferior equipment and little attention paid to the sanitary features, either in the design or operation of the disposal works.

The greatest cause for complaint arises from the odors produced in carrying on the work where the necessary equipment is not provided for deodorizing the gases. The odors will usually arise from one or two sources; the gases given off from the vents on the digestor tanks or the vapors or gases given off by the dryers.

The manner in which the gases can be deodorized consists in condensing the soluble gases and passing the insoluble gases through furnaces where they are heated to sufficient temperature to deodorize them. From experiments and tests the writer has made, using special high combustion furnace fitted up so that the gases were passed through the furnace at various temperatures, it was found that the insoluble gases from the cooking tanks were deodorized when heated to a temperature of 1200 degrees Fahrenheit, and very little odor could be found after heating them to 1000 degrees Fahrenheit.

The deodorizing of gases from the digestors or cooking tanks is not difficult, due to the small volume, as the material while being cooked is

sealed in the tank and the gases escaping are passed through closed vent lines to condensers which in turn discharge into a sealed hot well where the insoluble gases are trapped. The insoluble gases from the hot well are conducted to furnaces and deodorized with the combustion gases. The gases from the dryers can be deodorized in a similar manner, but it proves a more difficult problem where direct heat dryers are used, or hot air is used as a drying agent, due to the dryers giving off a large volume of air, which does not condense and must be heated to the desired temperature. When garbage is first cooked and pressed so that only a small per cent. of the moisture is required to be evaporated in the dryer, the boiler furnaces will usually be of sufficient capacity to deodorize the gases. When the dryer method is used and the green garbage, containing from 75 per cent. to 80 per cent. of moisture is first treated in the dryer, the volume of gases is so large that it will require additional furnaces to heat the great volume of gases to the desired temperature. In plants operating with the dryer method it has never been attempted, due to the excessive cost that would be necessary to maintain and operate the furnaces.

In utilizing garbage by the reduction method the fact must always be borne in mind that a low grade of material is to be utilized, which will not warrant recoveries beyond a point where the costs will be at a minimum after first considering the sanitary features. The developments in regard to the recoveries that can be made have advanced, until all the solids in the form of grease and tankage can be recovered at an economical cost. Other by-products besides grease and tankage can be produced from garbage but the work has not developed so that the additional cost will warrant making the recoveries. The grease at the present time is usually refined by the purchaser into several by-products such as glycerine, stearin, stearic acid, red oil, candle tar and soap fats, and no doubt some of the larger reduction plants would find it profitable to refine the grease so as to obtain the additional profit now derived by the refining companies.

One of the largest factors in developing the work in connection with the disposal of garbage by the reduction method has been the increased demand for the by-products. From the first plant installed at Buffalo and the by-products produced in the same, the number of plants has increased until at the present time there are twenty-five reduction plants in the United States from which there is produced annually approximately 60,000,000 pounds of grease and 150,000 tons of tankage, having an average market value of $3,500,000.

The disposal of garbage by reduction has been carried on in past years by private companies and previous to 1905 was not attempted by municipalities. In 1905 the city of Cleveland, Ohio, purchased a plant from a contracting company and has operated it since that date as a municipal enterprise with very satisfactory results from an economical standpoint.

The sanitary features had received little attention in the original design and the plant was so constructed that they could not be installed properly, although in rebuilding a part of the plant great improvement has been made.

The second and only other city operating a municipal reduction plant is Columbus, Ohio. The plant at Columbus was placed in operation in July, 1910, since which time very satisfactory results have been obtained. The plant has shown a profit since starting over and above the operating costs and the fixed charges, including interest and depreciation.

During the year 1911 the plant reduced 17,534 tons of garbage, an average of 56.56 tons per day, which is approximately one third the rated capacity. The operating cost for the year amounted to $1.84 per ton and the fixed charges, based on 4 per cent. interest and 5 per cent. depreciation, amounted to 97¢ per ton, making a total cost for disposal of $2.81 per ton. The receipts form sale of by-products amounted to $3.35 per ton, so that the plant showed an earning of 54¢ per ton over and above all charges.

Since the first of the present year a percolating plant has been in operattion to extract the grease from the tankage, which during 1911 was not recovered. During 1911 there was produced 2344 tons of tankage, which on analysis was found to contain on an average of 10.2 per cent. of grease. Based on the present recovery of grease by percolatoin 8 per cent. of grease would have been recovered, amounting to 188 tons and valued at $18,800.00.

The recovery of grease by percolation would have increased the receipts of the plant $1.08 per ton of garbage treated, and the cost per ton for treatment, including operating cost and fixed charges based on the present cost of percolating, amounts to 30¢, or the net earnings would have been increased 78¢ per ton of garbage by percolation, which would have made the net earnings $1.32 per ton, over and above operating costs and fixed charges.

In estimating the cost for the disposal of garbage by reduction, the figures given on the operation at Columbus for the year 1911 can not be taken without knowing the conditions to be met. If the Columbus plant had been operated at the rated capacity with allowance for seasonal variation an average of 125 tons per day could have been reduced. Had the plant been operated with an average of 125 tons per day, the operating costs would have been decreased from $1.84 to $1.40 per ton and the fixed charges would have amounted to 44¢ per ton instead of 97¢ with the earnings from the precolating plant per ton remaining approximately as given above, so that the total earnings over and above all charges would have amounted to $2.29 per ton. The figures given are based on the prices received for by-products during the year 1911, which amounted to $10 per ton for tankage and 5.03¢ per pound for grease, so that in estimating receipts from sale of by-products allowance must necessarily be made for fluctuating market value of the products.

Economical results may be obtained by the utilization of heat in the disposal of garbage, mixed with other refuse, by burning, but to prove satisfactory the maximum sanitary results must be obtained at a minimum cost and where the quality is such that it will warrant utilization, the reduction method will continue to show more economical results and with proper attention given to details and sanitary features the work can be conducted without nuisance.

INCINERATION OF REFUSE.

J. T. Fetherston,

Superintendent, Bureau of Street Cleaning Borough of Richmond, New York City.

Read before the Sanitary Engineering Section, American Public Health Association, Washington, D. C., September, 1912.

Two significant aspects of incineration as practised to-day in the United States will be considered, viz.: Garbage Cremation and Mixed Refuse Destruction.

I. Garbage Cremation.

During the past twenty-seven years, about two hundred garbage crematories have been installed by different cities and towns in this country, yet it was not until 1909 that comprehensive, scientific tests of this general type of incinerator by an unbiased authority became available.

Table No. 1 summarizes some features of the extensive observations made by the Engineers of the Ohio State Board of Health on four types of garbage crematories:—

TABLE NO. 1.

Tests of Garbage Crematories in Ohio, 1909.

City.	Material Burned.			Lbs. Equivalent Coal Used Per Ton Material Burned.	Avge. Temp. Combust. Chamber ° F.	Average Co 2 %.
	Garbage %.	Mixed Garbage %.	Night Soil %.			
Canton.....	100.	—	—	730.	755.	3.1
Mansfield.....	100.	—	—	362.	1002.	8.3
Marion.....	31.7	11.7	56.6	370.*	803.	1.2
Steubenville ...	86.	14.	—	642.	716.	1.6
Zanesville.....	81.	19.	—	631.	682.	3.7

*Coal equivalent of gas used.

The temperature in the combustion chambers of the five plants tested averaged 792° F., and as temperatures below 1250° F. indicate incomplete combustion, the authoritative conclusion from the observations that "the plants as operated fail usually to dispose of the garbage at a temperature high enough to avoid the production of odors" is significant and conclusive.

II. Mixed Refuse Destruction.

In 1906, the first mixed refuse destructor of the type evolved in Great Britain was installed in North America at Westmount, Canada, and today, four plants burning mixed wastes are operating in the United States.

Some data concerning the five destructors mentioned are summarized in Table No. 2:—

TABLE NO. 2.

Tests of Refuse Destructors.

City.	Test Period.	Material Burned %.				Av. Temp. Combust. Chamber, °F	Av. Co 2 %.	Evap. per lb. Refuse from and at 212° F.	Rated HP. of Boilers.	Clinker %.
		Ashes.	Garbage.	Rubbish.	Manure.					
Westmount, Canada	May 3, '06	70	15	15	—	1994	10.9	1.36	220	42.1
Seattle, Wash.....	July 31, '08 Aug. 1, '10 Two years	43.5	32.1	20.4	4.0	2376	10.2	1.00	220	43.2
West New Brighton, N. Y.	July 1, '08 July 1, '11 Three years.	68	24.9	7.1	—	(a) 1750	(b)8.8	(c) 1.23	183	40.0
Milwaukee, Wis...	May 19, '10 June 3, '10	43.8	42.4	5.8	80.0	1646	10.3	1.25	800	—
Montgomery, Ala	July 26, '11(f)	25	42	13	20	1920	11.0	1.37	180	—

(a) Fery recording pyrometer-continuous record.
(b) Simmance-Abady Co2 recorder.
(c) Meter record.
(f) Mainly street sweepings and green grass.

Compared with the tests of garbage crematories (Table No. 1), the average destructor temperatures in connection with the gas analyses indicate freedom from odors due to unconsumed gases — a primary requisite for satisfactory incineration of the wastes. Thus the mixed refuse type of plant corrects the inherent defect of the garbage crematory.

Three features in connection with mixed refuse destructors may be noted —no added fuel is required, steam power is produced and quite a residue (clinker) results.

At Westmount, Canada, power from the destructors (the 1906 plant has since been duplicated) is used in the adjoining municipal electric lighting plant, but the four destructors in the United States have as yet no advantageous outlet for the steam power produced, as private ownership of public utilities is in control. Milwaukee, for instance, was prevented

from operating an electric power station in connection with the refuse destructor because it would interfere with the rights of a private corporation, and in New York City, the charter prevents public competition with private ownership.

General Comment.

Incineration of refuse is not a cure-all and before its adoption by a municipality, alone or in combination with other systems of disposal, requires the same thorough preliminary study and expert analysis that any other engineering project should receive.

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REFUSE DISPOSAL.

On no occasion before the last Annual Meeting of the American Public Health Association has there been a public discussion, either in Europe or America, on the subject of Refuse Disposal so comprehensive in character and by as many authors, who have thoroughly studied it or have had a large practical experience with its various phases.

The subject is considered, as it should be, from the house pail to the final resting place of the material. It is considered from a broad standpoint, including all the various conditions prevailing in this country; such as cold and warm climates, character of fuel refuse, varying with the prevailing use of coal, oil or gas, which affects favorably or unfavorably the calorific value of a city's refuse, kitchen garbage, varying from a high food value for pigs to a dangerous use for this purpose, and from a high grease value to no practical value, and various other conditions which may or may not impose upon a community the disposal of manure, street sweepings, general rubbish, etc., in a sanitary and an economical manner.

From most of the papers the two general conclusions will be gained, first, that at the present time it is practicable to collect and dispose of the solid refuse of a city in a sanitary and economical manner, by well tested methods and without serious difficulties, secondly, and that the service is one which requires for guidance, the joint efforts, skill and experiences both of the medical profession and sanitary engineering, and for operation, well trained and faithful superintendents and men.

THE AWARD OF THE BUCHANAN MEDAL.

Members of the American Public Health Association must feel a special satisfaction in the award of the Buchanan Medal of the Royal Society of England to our fellow-member, Col. W. C. Gorgas. The con-

quest of yellow fever has been perhaps the most striking and dramatic of all the triumphs of sanitary science, since Pasteur displayed his anthrax-infected and his vaccine protected sheep at the farm of Pouilly le Fort. With the conquest of yellow fever, Doctor Gorgas has been intimately connected, almost from the first. After the epochmaking demonstration that yellow fever was transmitted, and only transmitted by the bite of the Stegomyia mosquito, accomplished by Reed, Carroll and Agramonte in 1901, it was Gorgas who took up the practical task of mosquito extermination and accomplished it so successfully that he was made Colonel by special act of Congress in 1903 in recognition of his distinguished services. In the next year he became chief sanitary officer of the Panama Canal Zone and in 1907 a member of the Isthmian Canal Commission. It has been rightly said by discriminating visitors to Panana that it is not primarily as an administrative triumph,—for there are plenty of big businesses in the United States that require as high an administrative faculty; it is not primarily as an engineering triumph,—for the New York Water Supply involves engineering problems of greater difficulty; it is as a triumph of sanitation that the Panama Canal stands unique. If our memory is not at fault it was Charles Francis Adams who described the Canal as the eighth wonder of the world, for precisely this reason, that one of the worst plague spots of the globe had been made fit and healthful for the life and work of man, an achievement unprecedented in the history of the human race and momentous for the whole future of the tropics. The discovery and the application of the principles that have made this possible is peculiarly the work of the American peoples. The first suggestion of the mosquito theory we owe to Finlay of Cuba. United States army officers working on Cuban soil carried the theory through to a perfect demonstration and in Cuba by Gorgas and Guiteras, in Mexico by Liceaga and his associates, as well as on the Isthmus, it has borne its richest fruit. The countries represented in the American Public Health Association all share in this honor which has come to Colonel Gorgas, and, through him, to American sanitary science; and American sanitary science could have no worthier representative to be the recipient of such an honor.

FIELD EQUIPMENT FOR LABORATORY WORK ON WATER SUPPLIES.

H. A. WHITTAKER,

Assistant Director, Laboratory Division, Minnesota State Board of Health.

Since August, 1910, a portable, emergency plant for the hypochlorite disinfection of water supplies has been maintained by this Board to permit the immediate disinfection of water supplies during a water-borne epidemic. This plant has already been described.[1] The maintenance of such a plant in constant readiness for field service has rendered possible the immediate disinfection of several infected water supplies during an actual epidemic. This exceedingly rapid method has brought with it a demand for laboratory apparatus which can be taken into the field for determining whether or not

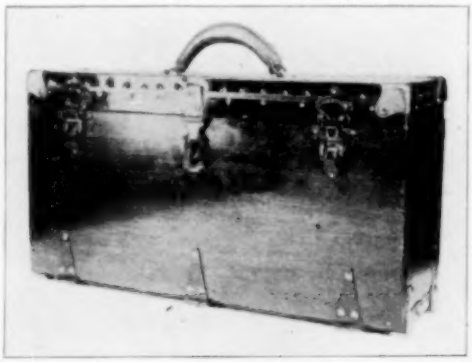

Fig. 1.—Case for chemical outfit.

the treatment is successful. For this purpose there is required chemical apparatus for following and testing the chemical phases of the hypochlorite treatment and a portable incubator, by means of which presumptive colon tests and bacterial counts can be made at once without losing the time necessary to ship the specimens from the field to the main laboratory for incubation.

To meet these demands, satisfactory outfits have been designed which lend very material aid and add greatly to the convenience of the investigator in applying the treatment. They have been used with great sucess in several instances. For the purpose of easy transportation each outfit is packed in a separate case which is divided into compartments adapted

[1] *Engineering News*, 1911, Vol. 65, No. 14, p. 402.

for its particular contents. The cases are made of ½-inch basswood, stained with a simple wood stain, the edges bound with sheet iron and brass. The top of each case is supplied with a convenient leather handle for

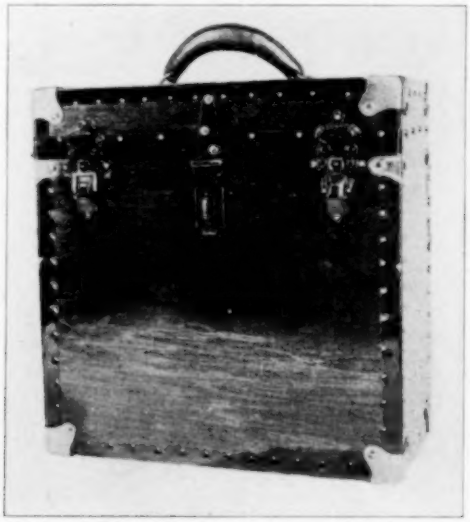

Fig. 2.—Case for field incubator.

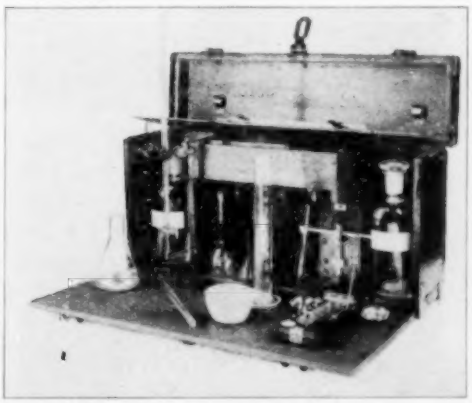

Fig. 3.—Chemical case ready for use showing compartments and contained apparatus.

carrying and opens on strap hinges at the back. The corners are bound with iron for protection in shipment. In addition, the front of the chemical case at the bottom is provided with strap hinges in order that the front may open down and provide a working table. The lid carries a hinged, iron

strap which engages with a staple on the front of the case and is secured with a padlock. The cases are shown ready for shipment in Figures 1 and 2.

Portable Chemical Outfit.

The chemical case ready for use is shown in Figure 3. The case is divided into the several compartments adapted for holding the particular apparatus. The lid is converted into a compartment by a hinged cover which is held in place by two small, brass hooks and which at the same time serves

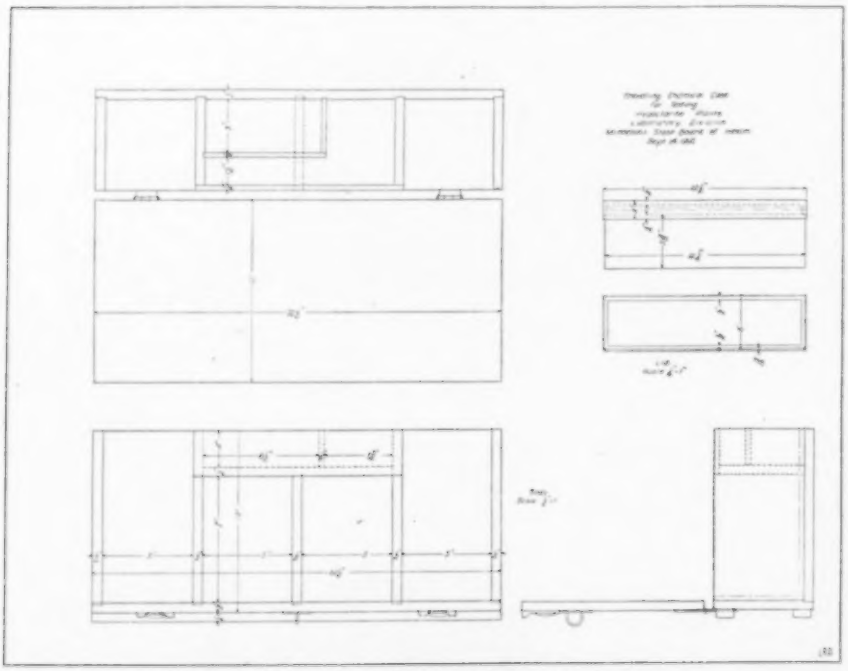

Fig. 4.—Chemical case drawings showing dimensions.

to cover the lower compartments when the case is shut. This lid compartment carries two 10 c.c. graduated pipettes and one 25 c.c. burette, each held in place by means of spring, brass clamps. The lower portion of the case is divided into six compartments. Each of the end compartments carries a 1000 c.c. glass stoppered bottle; in one is placed $\frac{n}{10}$ iodine solution and in the other $\frac{n}{10}$ arsenious acid solution. The end compartment at the left above carries a brass block into which may be screwed a threaded burette clamp. This is not shown in the drawing. The lower central compartments carry one 100 c.c. graduated flask, one 250 and one 400 c.c. Ehrlenmeyer flask and one glass funnel $1\frac{1}{2}$ inches in diameter.

The upper compartment is divided into two, one will just hold a case in which there is a collapsible, pocket scale. In the other sub-division there is placed one porcelain mortar and pestle $2\frac{1}{2}$ inches in diameter, and one 100 c.c. graduate. It may be necessary to grind slightly one edge of the foot of this graduate.

In preparing for shipment the two end compartments are lined with corrugated paper. The glassware in the two center compartments is packed in paper or cotton. No packing material is required in the other compartments. Sectional drawings are shown in Fig. 4.

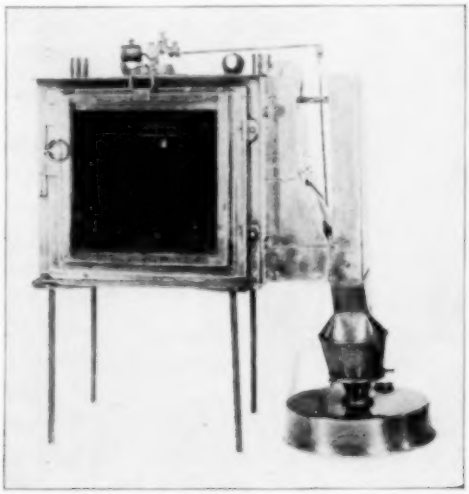

Fig. 5.—Field incubator ready for use.

Portable Field Incubator.

The field incubator set up ready for use is shown in Fig. 5. It is made by adding certain features to any water-jacketed, copper-lined incubator or paraffin oven. The attachments consist of a device for applying heat from the kerosene lamp and a regulating apparatus. The heating apparatus consists of a heating shaft and a radiator shaft which are attached to one end of the incubator by thumb screws. The radiator shaft which is applied directly to the side of the incubator is closed at the bottom and covered at the top with a hood. It contains a small water radiator made of a thin rectangular, copper compartment intersected with $\frac{1}{2}$-inch copper tubes for increasing the surface exposed to the heat. This radiator is attached to the incubator at an angle of about 45° by means of two $\frac{3}{8}$-inch brass pipes, one at the top and the other at the bottom of the radiator.

The heating shaft, attached to the lower end of the radiator shaft, is rectangular in shape made of copper—open at the top and bottom and fits over the kerosene lamp used in generating the heat. Between the

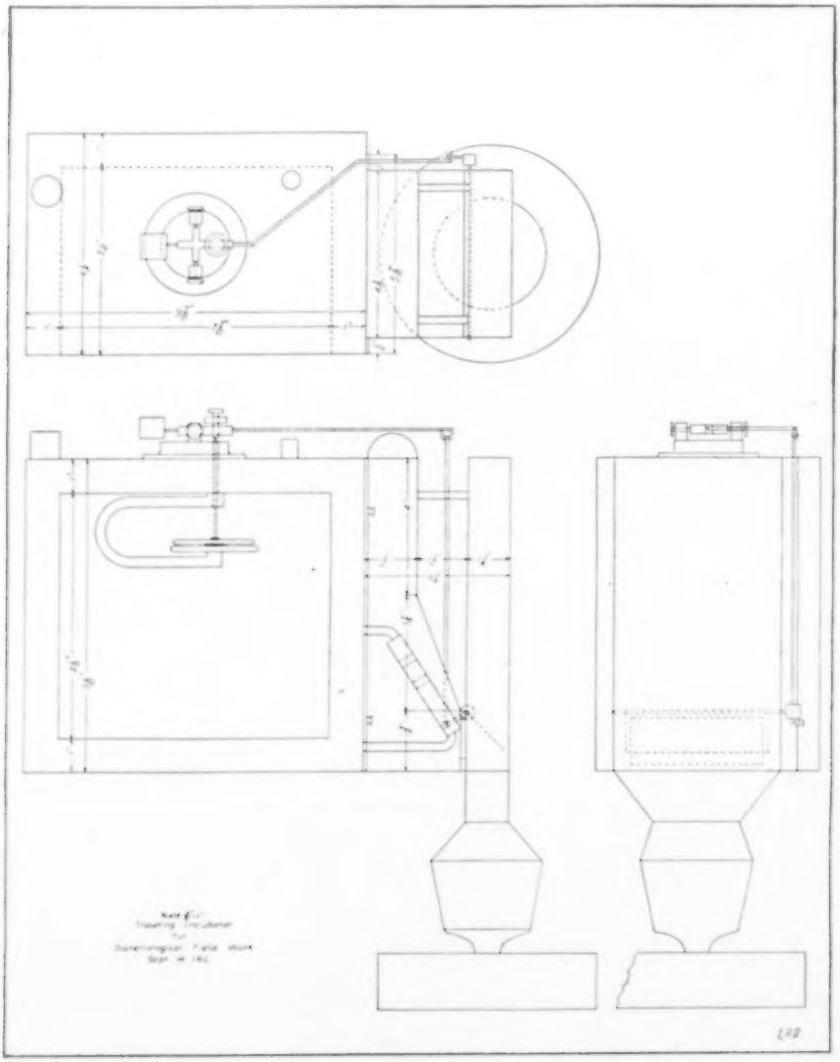

Fig. 6.—Field incubator showing dimensions.

heat shaft and the radiator shaft is a small door hinged on a rod by means of which the heat can be turned on the radiator or shut off from the radiator as necessary. The thermo regulator is of the ether type and consists

of two disk-shaped, sheet brass receptacles superimposed upon one another, held in position on a metal arm within the incubator. On the upper one of these there is centered a small vertical rod which passes through the top

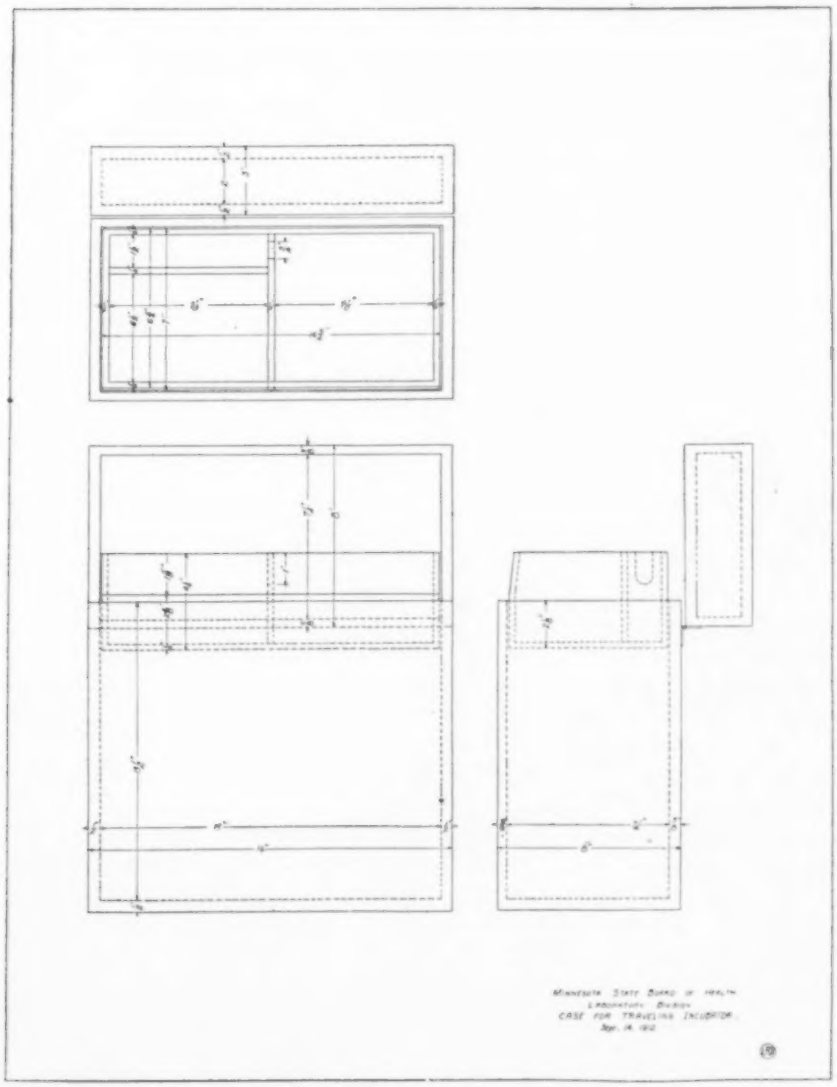

Fig. 7.—Incubator case drawings showing dimensions.

of the incubator and engages itself with the end of an adjusting setscrew which is held in place by a small iron casting. This casting is hinged on a cast-iron stand between two setscrews. To one end of the casting is

attached a short rod carrying a weight for balancing purposes, and to the other end is a longer horizontal rod which hinges to a vertical rod near the end of the incubator. This vertical rod is in turn attached to the arm of the small door separating the heating shaft from the radiator shaft. The adjusting device consists of the setscrew in the horizontal arm which engages with the rod attached to the ether disks. This can be so set that the heat is automatically cut off at any given temperature from the radiator shaft by closing the small door when the heat will simply ascend through the heating shaft. Should the temperature fall below the desired point the ether compartments will contract lowering the horizontal rod and hence the vertical rod, and as a result the intervening door between the heating shaft and radiator shaft would be opened, thereby deflecting the heat into the radiator shaft. Sectional drawings are shown in Fig. 6.

The ether disk principle has been used for a considerable time, but its application in this manner to this type of incubator appears to be new.

The kerosene lamp used in generating heat has a capacity of 750 c.c. which is sufficient oil to last for 12 hours.

The incubator rests on a stand of suitable height which can be collapsed like a pair of scissors. The apparatus is packed in a specially constructed case shown in Figs. 2 and 7. The main compartment is just large enough to hold the incubator itself with the collapsible stand. The compartment in the lid carries the lamp, its chimney and the horizontal and vertical rods of the regulating device which can be easily detached, all of which are placed in a removable tray. The principal advantages of this incubator are: the ease with which it can be transported; the simplicity of its adjustment and operation; the rapidity with which a constant temperature can be obtained; and the fact that it is not dependent upon an electric current or gas for heating, so that it can be used practically anywhere.

This apparatus has received considerable use in this state in investigating water supplies, and has proved of very considerable service in obviating some of the difficulties which had previously been experienced.

By using the small inverted tube method for small amounts of water it is possible to apply the presumptive gas test for B. coli to 24 samples at one time and still leave one half the incubator space for petri dishes or some other purpose. The gas determinations for B. coli in 100 c.c. amounts are made in the regular laboratory glass-stoppered sampling bottles, 150 c.c. capacity, which are graduated to 100 c.c. These bottles are also equipped with the inverted tube before they are shipped into the field.

This outfit, while it may be used for any field operations, was designed primarily to assist in the routine investigation of water supplies as undertaken by the Laboratory Division of the Minnesota State Board of Health. A complete description of the routine methods for water investigations, as followed by this laboratory, can be obtained in the biennial report for the years 1911 and 1912.

HOUSING PROBLEMS.

THOMAS JORDAN,
Board of Health, Boston, Mass.

Read before the Massachusetts Association of Boards of Health, October 29, 1912.

This subject-matter is brought before this organization by the Boston Board of Health for the purpose of securing the coöperation of this Association, and, if the Association so directs, to have a resolution passed instructing your legislative committee to use all its efforts to procure the passage of the bills brought to your attention in this paper.

I adopt the title "Housing Problems" for the reason that the two bills spoken of embrace two of the worst problems as far as sanitary conditions are concerned with which the Board of Health has to deal. In Massachusetts a tenement house is a building which contains more than three families living independently and cooking on the premises. Up to the year 1892 the law governing the number of families in a tenement house included three-family houses. In almost all of the large cities of the United States, and particularly in the western cities, the law has been revised so as to include two-family houses; and I have been informed by the secretary of the National Housing Association that a movement is on foot in New York to make the two-family house a tenement house in that state.

There is no question but what three-family houses should be brought within the scope of the tenement house laws, as in houses inhabited by three families the conditions are, as a rule, such as to require inspection more than the houses containing a larger number of families for the reason that in the construction of such buildings the requirements are not as stringent as in the case of larger houses. A great many houses have been altered from single-family houses into three-family houses without providing the proper sanitary conditions, and in a great many of these houses the one water closet provided is usually located in the cellar where it cannot be properly taken care of. There is no question that the majority of these houses should be maintained under the same laws governing the care of yards, areas, water closets, whitewashing and the providing of ash and garbage receptacles, as control houses which contain a larger number of families. Conditions cannot be as good where there is a divided responsibility and where no one is entirely accountable under the law. In the tenement house the landlord is obliged under statute law to furnish proper ash and garbage receptacles; in the three-family houses the question of ash and garbage receptacles is governed by the city ordinances, which prescribe that no person shall place ashes or garbage except in proper receptacles, but no one can be convicted of violating this ordinance

unless they are caught in the act of placing ashes or garbage in unsuitable receptacles, which, of course, it is almost impossible to do.

In the year 1911 the Board of Health, through His Honor the Mayor, introduced a bill in the Legislature providing for the inclusion of three family houses within the tenement-house laws; but this bill merely changed the word "four" to "three," so that the bill carried the fireproof construction clause for the three-family building as it has been covering the four or more family structure—and it was a foregone conclusion that the bill would be defeated in this form.

Three Family House.

In the year 1912 another bill was introduced which governed only the sanitary conditions required in buildings under the tenement house law, but the bill was again defeated. The Board of Health has been subjected to a great deal of criticism because of the conditions prevailing in these three-family houses; and it is astonishing to find that a large number of people interested in social and sanitary work do not know that three-family houses are not tenement houses. It is only a short time ago, in giving a short talk to the nurses connected with the Consumptives' Hospital Department, that the fact was brought out by me that these nurses were astonished to find that three-family houses were not legally included within the scope of tenement house laws, and that they can only be examined by the Board of Health upon specific complaint or when a nuisance

is known to exist in the premises; although a great many inspections have been made in these houses upon complaint of visiting nurses and social settlement workers.

There is no question that if this bill was passed a great improvement would be made in the conditions of these three-family houses, as it would then be necessary for the Health Department to examine them semi-annually and drainage, overcrowding, whitewashing, care of water closets, yards, areas, and the providing of proper ash and garbage receptacles, would be looked after systematically.

Three Family House.

The next matter I wish to bring to your attention is the overcrowding found in the congested sections of the city. Under the regulations of the Board of Health 400 cubic feet of air space is required for each adult, and 200 for children under twelve years of age. This overcrowding exists mostly during the winter months, when laborers who have been working out of town during the summer floock into the city to lodge during the cold weather. A visit is made by the health inspector during the daytime, where apparent cases of overcrowding exist; a visit is then made at midnight as that is the only time when the number of persons occupying a room or rooms can be determined with positive certainty. Cases are frequently found where mattresses are placed on chairs, tables, and kitchen stoves, and last winter three men were found sleeping on mat-

tresses placed on top of a piano. The only remedy under the present law for this overcrowding is a vacation of the premises. The rooms are measured and a vote is taken by the Board of Health stipulating the number of persons that may occupy the same. The walls of the rooms are stenciled as to the number, the owner is notified, and within a week another night visit is made to determine whether the rooms are still occupied in excess of the number allowed. This has to be done over and over again, and in some instances the same persons have been ordered to vacate premises every year for the last eighteen years. The Board of Health for the last

Over-crowding.

two years has had a bill in the Legislature to make overcrowding a criminal offence, but these measures have been twice defeated.

The chairman of the Board of Health (the president here today, Doctor Durgin) and myself appeared before the committee of the Legislature and stated the facts as we found them, and pictures were brought to the attention of the committee which had been taken at midnight showing the actual conditons found. In 1911 the bill had leave to withdraw, but through the efforts of some members of the committee the bill was recommitted, and the committee expressed a desire to visit some of these premises during the night visits and five members of the committee made one of these night visits and then explained to the full committee the conditions as they actually found them. The bill was passed in the Senate but was

defeated in the House. In the year 1912 the bill was again introduced into the Legislature and a hearing was again had before the committee; no opposition was offered to its adoption, and at the hearing a member of the committee, who was one of the visiting committee of the year before, made the statement to the committee that no matter how strong the statements were made in regard to this overcrowding, they could not begin to describe the conditions. There can be no question but what this should be made a criminal offence, as almost invariably where you find the families have children the children are obliged to sleep on the floors, almost always with their day clothing on, and then get up in the morning and go to school or go to work. This condition is not brought about because of poverty, and this fact is illustrated by the thirty-four cases brought into court during the year 1910; in every instance cash bail of $300 was furnished by the offenders; and in every case but one the offender was found guilty and fined from $20 to $50 (generally $50), and these fines were promptly paid on the spot. These different persons were arrested under the Public Lodging House Act which provides that no person shall conduct a lodging house for ten or more persons at a charge of less than 25¢ per night without being licensed by the police commissioner. These different offenders were found to be letting beds at ten cents per night in numbers ranging from fifteen to thirty-four. We happened to have a late spring that year. These people generally hire these rooms by the week or the month, but the spring was so late that year that they expected every day that they would have a call to go out of town to work. Instead of hiring their rooms by the week or month they started in to hire them by the night. One night, about half past one o'clock, in one of these houses a man who ran a restaurant on Garden Court Street in the North End brought in two men to lodge, and they paid ten cents apiece in our presence; and then we started an investigation and found out that they were all paying that price on account of the lateness of the spring. In one instance a man was found with sixteen lodgers, himself and wife, and three children, all sleeping in the kitchen, and four grown-up daughters, ranging from 16 to 22 years of age, sleeping in a dark closet; the offender worked for a salary of $12 per week, one daughter at $11, two daughters at $10 and one at $9 per week; and this case was seen by the members of the committee who made the night visit. There is no question that if this overcrowding was made a criminal offence it would break up the business; it is surely done for a profit, as second offences have occurred where they have been brought into court and fined. On the other hand, repeated instances are found every year for the last eighteen years of the same offenders who have been driven from house to house by order of the Board of Health on account of this overcrowding.

In visiting these overcrowded rooms it is always found that the windows are tightly closed and almost always covered, the doors closed, and a kero-

sene lamp burning in every room. The lodgers almost invariably wear all their day clothing, with the exception of the outer garments. Since the bringing into court and fining of the thirty-four defendants cited, it has been impossible to find any more cases, as both landlord and lodger always say that the room is hired by the week. In almost all of these cases where overcrowding exists the children are deprived of their beds and bedrooms, and it is no uncommon occurrence to find children, both male and female, twelve, fourteen and sixteen years of age, either sleeping with their parents in the same bed or in a small bed provided alongside of the larger bed. Very frequently grown-up boys and girls sleep together in order to provide room for lodgers, and very often cases are found where the grown-up daughters of the family have to pass through the sleeping room of the lodgers in order to get to the room in which they sleep themselves.

In most cases where this overcrowding exists the man who keeps the lodgers does not work, but his wife is compelled to do the washing and cooking for the lodgers, they providing their own provisions. I want to call your attention to the case of a man whom we have found conducting one of these lodging houses every year for the last three years and whom we have forced to move from place to place; he does not work, but for the last three years, upon a visit to his premises at half-past one o'clock in the morning, I have found his wife, a woman of sixty-five years of age, washing the clothing of the lodgers, and she has told me herself that she wished some means could be taken to prevent her husband from taking these lodgers and obliging her to do the work.

And now, ladies and gentlemen of the Association, in conclusion I would request this Association to do what it can to further the passage of these bills, as I have no doubt that the sanitary condition of Boston, as well as every other city in the Commonwealth, would be improved if these bills were enacted. I am sure that this would particularly be the case in regard to the bill treating overcrowding, as it certainly is discouraging for us to keep doing this work year after year, driving the same people from one place to another, when, if their profit was taken away by the payment of fines, the business would certainly be discontinued. If the Legislature of Massachusetts enacts a bill, as it did this year, making a three-family house a tenement house in towns in Massachusetts, it is certainly inconsistent when the same Legislature refuses to pass a bill making a three-family house a tenement house in cities.

The bill introduced by the Civic Service League of Massachusetts made a two-family house a tenement house, but at the last moment in the Senate it was changed from two to three. The president of the Massachusetts Civic Service League told me recently, however, that they were going to put in another bill this year making a two-family house a tenement house.

Discussion.

Doctor Chase. We have listened to a good paper this afternoon. I am glad that Mr. Jordan originally came from my town, Brookline, and has brought up this important question in the striking way he has, for it is a very strong indictment against a great evil, this overcrowding in tenements and this terrible congestion in certain places. Last week it was my good fortune to hear Mr. Jordan speak on this question at the State Conference of Charities in Haverhill. He spoke in the forenoon. In the afternoon Mr. Frederick C. Howe, of New York, now the head of the Cooper Institute, and formerly an alderman of Cleveland, Ohio, was one of the speakers. He is a man of education and wealth who has studied the housing problem in this country and abroad. He owns land in four or five cities, and so has a direct personal interest in the question; but at the same time he is a very public-spirited man and has studied the problem very thoroughly from every point of view. He said: "Friends, we have the housing problem. Why do we have to have a housing problem anyway? As the result of my investigations here and everywhere (and I will confess I am a land speculator) I have come to the conviction that it is all because we have an unsolved land problem. The land problem, or problem of the proper taxation of land, is not yet satisfactorily solved. When the land problem is solved we will no longer have this housing problem that causes so much agony among social workers and sanitarians and health officers."

The indictment of Mr. Jordan is a perfectly just one, but if we do succeed in punishing the owners or the men who let these cheap tenements for allowing more than one proper number of men and women to be crowded into them, will that remove the cause of it? Of course it will not. We have got to go deeper than that. It has been shown by Mr. Howe and others that if only we will tax the improvements that are made upon land less and less each year until all taxes upon the houses, stables and factories are removed to the land value, *i. e.*, the value of the land they rest upon, and if unoccupied land in the cities is taxed for its real value, the value that could be made of it if properly employed and improved, then by that process in a very few years, almost fifteen or twenty years, the whole tax would be transferred to the land. That would work out in the case of homes such as most of us occupy in taxing our houses, our stables, our garages, our factories, nothing at all, and raising somewhat the tax we now pay on the land. That single tax on the land value would be much less than the sum total of the tax now paid on our house and stable and land.

In the cities, as you know very well, in Boston and in New York, in every large city in the United States, we have large areas of unoccupied land within the city limits. Look at Brighton and other places close to the factories and tenements where our workers live. We only need to stop punishing the owners of tenement houses and other buildings for putting those improvements on them to encourage them to build. They could then build and get their four or five per cent., and could lower the rents to the occupants—that is the important thing—lower the rents to the occupants and still have their profit. The first step in that direction would be to have a law passed in our Legislature, such as came up last year and the year before, calling for the right of towns and cities to have local option in the matter of taxation. Then they could adopt the plan of increasing the tax on land values, at the same time reducing the tax on buildings, thus bringing about the single tax. In that way our land problem would be solved. Then our housing problem would disappear because we would have ample accommodations for the boarders and lodgers who now are crowding in to the tenements of the people who are willing to take them for the small sum of ten or fifteen cents a night.

I am in sympathy with the bills which Mr. Jordan advocates and think they will undoubtedly pass. At the same time, we must not forget that we must go deeper and educate the public, which is now so ignorant or so stupid that it does not see this way out of its dilemma, and thus get rid of the land speculator, the land problem and the housing problem. In England they are already starting out on reform in the direction of the single tax, also in many cities in Germany, and recently in Vancouver.

SOME PRACTICAL CONSIDERATIONS ON THE PRESENCE OF LEUCOCYTES AND STREPTOCOCCI IN MILK.

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Read before the Massachusetts Association of Boards of Health, October 29, 1912.

There is, of late, a great awakening of interest in matters pertaining to health, and this interest is engaging the attention, not alone of physicians and health officials, but, what is of vast importance, of the public as well. We need only look at the daily papers to see to what extent this is evident. Various health matters are being brought before the people but hardly one with such repeated insistency as that of pure milk; this has become a public question, and it is good that such is the case.

Of the various questions pertaining to milk it seems to me of pressing importance that we recognize some practical method whereby we can determine infected milk and thereby take effective steps to exclude such from the market. The question of pus and streptococci in milk has long been disputed. Many views have been expressed upon it, some claiming one thing and some another. I want, in this paper, to bring before you certain practical views which have proven of value in excluding infected milk from the Boston market.

Is this an important question? Every question pertaining to health is important. Has this a bearing upon the question of health? Is the presence of pus and streptococci in milk apt to effect the health of the consumer?

In the report on milk by the U. S. Public Health Service ten well-known authorities are cited who claim to have seen epidemics of sore throat, enlarged cervical glands, intestinal disturbances and fever, which, they say, were found to have been caused by the drinking of milk containing streptococci and derived from herds among which were cows with inflamed udders. Holst, one of the investigators, drank 200 c.c. of the suspected milk, and soon after became ill with colic and diarrhœa.

About two months ago I found pus and streptococci in a sample of milk sent in from a children's hospital; at that time, as I learned later, an epidemic of vomiting and diarrhœa broke out among the babies at the hospital, and was so severe that a number of the children died. On receiving my report the milk supply was investigated at the farm where it was produced. Two cows were found suffering from mastitis; these were removed from the farm and thereupon the epidemic ceased.

From these facts we must admit this question is of importance since they prove that infection has been caused by the drinking of milk containing pus and streptococci due to mastitis in the cow.

In milk, what constitutes pus and what is the significance of streptococci? When speaking of pus we always think of increased polymorphonuclear leucocytes—yet I think it questionable to say that the evidence of pus as seen in milk, consists solely and essentially of an increase in leucocytes. We may find pus in cases where the leucocytes, though somewhat increased, are not increased to such an extent as to be the sole factor in determining our judgment; where, were we to depend upon this increase alone, we might not claim the presence of pus; but when with the leucocytes we find pus-producing organisms in close relationship, the condition is sufficient to determine the question. You can understand how this may be so, where one is examining an infected milk, which had been mixed with a large amount of non-infected milk; in such a case we might find a relatively low number of leucocytes and yet pus may be present.

However, in many cases we must depend upon a marked increase in leucocytes and this is often the only evidence to be found. Then comes the old question—how much of an increase is necessary to establish the presence of pus? We can determine the abnormal only when we know the normal. All milk contains these elements and the number in any given milk is found to vary from time to time, leucocytes in milk not being limited as they are in the blood. We know they are increased during the early days following calving and when the milk secretion is drying up. Many have tried to determine the normal number of polymorphonuclear leucocytes in milk; the limits of variation found being generally from about 10,000 to 500,000 in a cubic centimeter. The number found will vary with the method used; less being found by the smear and stain method than by the Doan Buckley method.

As to the Doan Buckley method—it is undoubtedly accurate but it requires more time than can always be given by one doing milk work for a large city like Boston. It is claimed that if the milk is momentarily heated at 70° C. we can obtain results about as accurate by the simple smear method as by any, and it requires but little time.

Stone and Sprague with the Doan Buckley method, counted the leucocytes daily during the entire milking period, using two cows for this purpose, and the counting altogether 1,167 samples. Of these,

1 1-5 % showed leucocytes below 10,000 per c.c.
7% showed leucocytes between 10,000 and 20,000 per c.c.
61% showed leucocytes between 20,000 and 100,000 per c.c.
29% showed leucocytes between 100,000 and 500,000 per c.c.
and only 1% showed leucocytes above 500,000 per c.c.

From this work they concluded, that the physiological average is considerably below 500,000 per c.c. and they state, "very seldom would the mixed milk of ten cows go above this figure unless there were present abnormal conditions in some of the animals." With the two cows selected by them the average was above 500,000 only three times in a total of 538 counts.

The average variations quoted by most investigators, including those of Stone and Sprague, are based upon examinations of milk from single cows. No two cows' milk will be found to contain the same number and the number in the milk from any given cow is found to vary from time to time. We ought not to regard, nor interpret the findings in the milk of one cow nor of two cows, in the same way as we would a mixed milk and this is a practical point to be considered when examining municipal market milk which is always mixed.

At any given time some cows show a high count, some a low count. Investigators have found a larger percentage of low counts than of high. Although these differences, which will obtain, cannot be expected to act as a fine adjustment, equalizing a mixed milk to any given number yet, we are justified in expecting that the variation in numbers should, under normal conditions, be confined within narrower limits and so would not show such a number of high counts as are found now and then in the milk of one or two cows.

The rule followed here in Boston during the past six years has been that in the sediment of two cubic centimeters of milk smeared over an area of four square centimeters and examined by a $\frac{1}{12}$ oil immersion lens, any sample showing fifty or more leucocytes to a field is regarding as containing pus.

Some claim that the cells which have been long regarded as leucocytes are epithelial cells from the lining membrane of the milk ducts of the cow's udder and not leucocytes. With such a view I cannot agree for the reason that epithelial cells are mononuclear whereas those considered as bearing on the possible question of pus are polynuclear. True the epithelial cells do, when dividing, appear as polynuclear cells but they do not divide with such rapidity as to number from 500,000 to several millions to a cubic centimeter, and again the sediment of milk from a tubercular udder in which the presence of pus is not disputed shows an immense number of these polynuclear cells.

Personally since the determination of pus, except from the presence of pus-producing organisms, is, as yet, an undecided question, except in instances where field after field is crowded with polynuclear leucocytes matted together, I think we are, as yet, not justified in taking a determined stand upon the presence of pus in milk based solely upon the number of leucocytes present. Yet, I think it practical, that every milk sample showing over 60 polynuclear leucocytes to a $\frac{1}{12}$ oil immersion field should be

marked suspicious and receive special attention, the cause where possible being determined. From such findings we have in the past discovered many tubercular cows which up to that time had passed unnoticed, their milk going to market regularly, and I hope that by systematically carrying out such an investigation over an extended period, we shall be able to take a more definite stand on the question of pus.

Certainly where field after field is crowded with leucocytes one would not hesitate to claim pus present even though no bacteria were evident. Such a finding should lead us to test for tubercle bacilli.

Apart from the number of leucocytes their arrangement, relative to each other, deserves consideration. At times we find many leucocytes but they stand more or less apart from each other single and discrete. Where pus is present the leucocytes tend to be bunched and, as it were, matted together and often we find closely associated with them the streptococcus.

Practically all milk contains streptococci and at times the streptococcus lacticus may reach as high as from 50 to 90 per cent. of all germs present, depending much upon the age of the milks and the temperature at which it has been kept. We know that cows are often affected with mammitis, hence, the occasional presence of streptococcus pyogenes in milk is to be expected.

Having examined over 10,000 samples of milk I almost daily see the streptococcus lacticus, but examining from 500 to 800 samples a month, only occasionally, say three or four times a month, do I see the streptococcus pyogenes.

When doing municipal work it is necessary that we use the quickest methods possible consistent with accuracy, since, when any condition is found that may possibly be a detriment to the health of the consumer, we must immediately trace such to its source and isolate either the cow or cows at fault. Were we to follow methods that require several days you can readily see how much time would be lost.

We know the streptococcus lacticus is the least harmful of all germs ordinarily found in milk; in fact at times it is beneficial, particularly in the making of milk products, and to condemn milk for its presence would be, not only folly, but an injustice. Were we to do so, we would have to condemn all milk, as it is found in practically all milk.

Though the least harmful of milk bacteria it should not be present in great numbers. If so, it is an evidence that the milk is either old or has not been properly cooled, the latter being the more probably since streptococcus lacticus grows best at about 70° F.

How, then, shall we differentiate between the streptococcus lacticus and the pyogenic streptococcus? Many methods have been tried by various investigators. Some have relied upon the power of the streptococci to ferment various carbohydrates. Bergey claims to have found that the

streptococcus pyogenes is able to ferment lactose and saccharose, but does not affect salicen, sorbite, raffinose, nor inulin; whereas the lacticus, ferment lactos, saccharose, salicen and raffinose but does not affect sorbite nor inulin. Yet again he found that some streptococci isolated from milk were able to ferment all the carbohydrates used. Hence we cannot rely upon the fermentation method.

Blood agar tests have given fair results, but they are not absolute, since streptococci other than the pyogenic have been proven capable of producing haemolysis. Muller found that milk streptococci (by which I suppose he meant streptococcus lacticus) were almost as often hermolytic as the pyogenic. Hence we cannot depend absolutely upon the test for haemolysis. So far cultivation on various media has given no distinguishing points.

Bergey has also tried out the acid agglutination test. This was based upon the work of Michaelis, who claims to have differentiated the B. typhosus from the paratyphosus and the B. coli; and Bergey had hoped by this method, to have been able to differentiate the various strains of streptococci, but he tells us with very unsatisfying results. As he states, "Some of the cultures showed complete agglutinations in all dilutions, others showed no agglutinations in any dilutions, while others showed varying degrees of agglutinations. These methods have not proven satisfactory and further more they all require too much time.

We want a method whereby we may be able to immediately recognize the presence in milk of streptococcus pyogenes so as to be able, without delay, to prevent the further placing of such milk upon the market.

Can we depend upon the microscope to determine the presence of pyogenic streptococci in milk? I think we can.

When we find streptococcus pyogenes in milk, we naturally expect to see with it evidences of its pus-producing property, we expect to see pus. Whereas with the streptococcus lacticus since it is not a pus producer, we do not expect to find pus even though the organism is present in very great numbers. I do not understand why some claim that because streptococci are present in milk in great numbers, such milk should be judged infected. We at times come across samples loaded with streptococci but showing no pus, no evidence whatsoever of an inflammatory process, and it is undoubtedly a mistake to say that, because streptococci are present in great numbers, that from this fact alone, we can conclude that they are pyogenic.

Again some have said that streptococci forming long chains are pyogenic while those forming in short chains are non-pyogenic. The length of a chain is not an essential factor. True in most cases the pus producers grow in long chains, particularly in milk, while on the other hand, the streptococcus lacticus generally grows in short chains, but this is only accidental and not an essential difference. The division of streptococci into streptococcus

longus and brevis is not tenable, as a short chained streptococcus grown on another medium often appears as a long chained streptococcus. So when examining milk, if we find streptococci present, even in large numbers, whether the chains be long or short, if no pus is present, we are not dealing with streptococcus pyogenes. On the other hand, if we find only a moderate number of streptococci and these are accompanied by, and intimately associated with, polymorphonuclear leucocytes massed together, we are justified in claiming the presence of streptococcus pyogenes. With the streptococcus lacticus we may find a fair number of leucocytes, but they are not closely associated with organisms but stand apart from them; I mean the general picture so impresses you. You may find occasionally a few leucocytes and streptococci together, such is to be expected, but it is not particularly characteristic. Whereas in an infected milk the picture is characteristic; here we see streptococci absolutely surrounded by polymorphonuclear leucocytes, as it were, buried within a mass of these elements, and whereever we see the streptococci we find the same identical picture showing an intimate, close relationship between the streptococci and the leucocytes. Between these islands of leucocytes, in the clear spaces, we see no streptococci. This is the picture to which I wish particularly to call your attention. This is the finding upon which I base my judgment, and it is from such findings, that we have traced many infected samples to the dairies and in every case found conditions warranting the condemnation of the milk.

Coming down to a practical working basis; the fermentation method, the hemolytic method, the acid agglutination method—none of these have proven their value; whereas on the other hand, our findings at the dairy have confirmed our stand on the value of microscopic examination for determining the presence of pus and streptococci pyogenes in milk.

Some of the conditions traced to the dairies from our laboratory findings are:

Inflamed udder	47 times
Tuberculous	8 times
Portion of udder atrophied	4 times
Cows recently calved	40 times
Cows drying up	20 times
Sore teats	4 times
Cow with partially retained afterbirth and foul discharge	1 time

Hence milk at times contains virulent pathogenic streptococci. When present evidence of an inflammatory reaction will be found and thereby distinguish them.

Since many epidemics have been traced to this cause, with death in some cases, it is the duty of health officials, to safeguard the public from such milk. This can be done by microscopial examination. All such milk should be excluded from the market immediately and those having it for sale should be punished. It is within the power of the large milk contractor to prevent such milk going for sale and should they fail to do so they deserve punishment.

The two accompanying photographs show the difference between the lacticus and the pyogenic streptococcus. The person who made the photo-

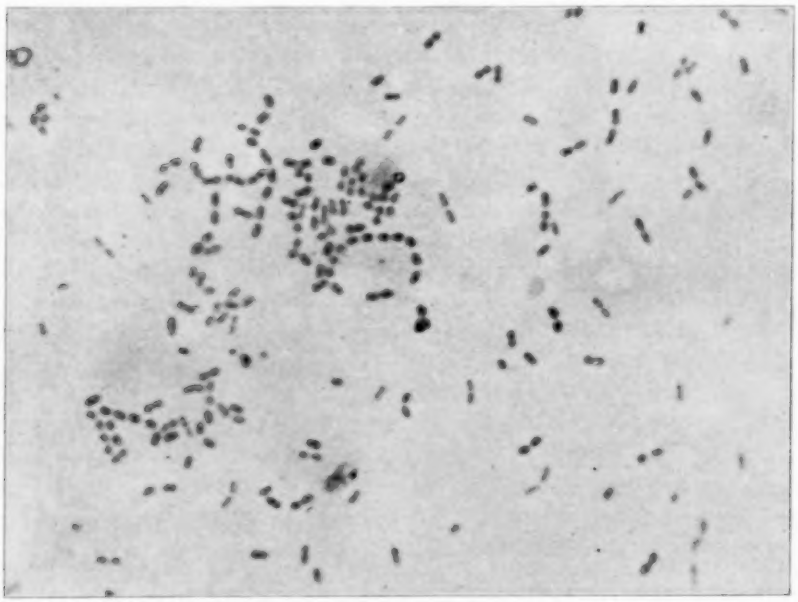

Fig. 1.

graphs did not pick fields such as I would have wished. I would prefer for the streptococcus lacticus to have a field showing longer chains, because sometimes we get the lacticus showing quite long chains, although as a rule not as long as the pyogenic. I would also prefer a field with a large number of leucocytes and not one absolutely free from them.

Fig. 1 shows the streptococcus lacticus. There is one point here of differentiation between the streptococcus lacticus and the pyogenes. The streptococcus lacticus tends to break up into diplococci, the pyogenic does not. We have here a large number of streptococci, but no evidences whatever of an inflammatory reaction.

Fig. 2 is a different picture. I had hoped also in this picture to get a

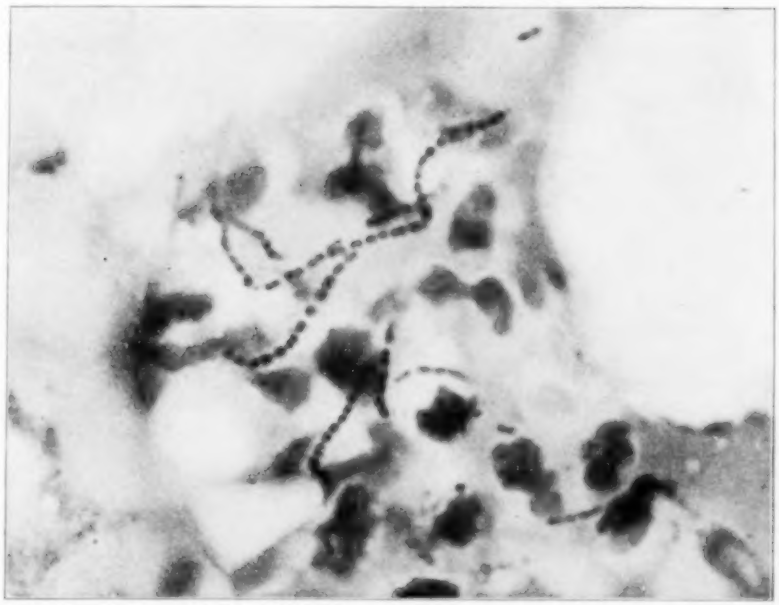

Fig. 2.

more general view, with less of the detail, so as to have several bunches of the infected material showing. Here the streptococci are intimately associated with the leucocytes; they are buried right within them. And in an infected milk we find all through the slide such islands of leucocytes and streptococci as the one shown in this picture, and in the clear spaces between these masses of leucocytes and streptococci we generally see no streptococci. Wherever we find the streptococci we find the leucocytes closely associated with them. That I think is the distinguishing point. By means of such a microscopic picture we have isolated many infected cows at the dairy.

Discussion.

Doctor Denny. I would like to ask Doctor Scannell whether epidemics of streptococcus infection in human beings have been traced to streptococcus infections of cows.

Doctor Scannell. Yes. In the report by the Marine Hospital Service on milk, a work which was carried on under Doctor Rosenau, mention is made of ten different authorities who claim to have found epidemics which they proved to have been due to the drinking of milk infected with pus and streptococci.

Among them is Holst of Christiana. Holst himself took some of the milk at the time, drank 200 cubic centimeters of it, and was taken violently ill with colic, diarrhœa and fever, showing symptoms, the same as those shown by a number of people who had previously been infected. That is but one of the epidemics that is spoken of in this report of the Marine

Hospital Service. As I say, in that article there is mention of ten different epidemics reported by ten different investigators.

"In Anglesea in 1897 fifteen people who took milk from one dairy became infected at about the same time with sore throat. Several persons in the affected families, who consumed milk from the same source, but in a boiled state, escaped the sore throat, the chief evidence of which was tonsilitis. The bacteriological examination of the milk revealed the presence of streptococci pyogenes and staphylococcus pyogenes, but no diphtheria bacilli. Bacteriological examination of patients' throats yielded precisely similar results.

Of course we know that an examination of the throat in many normal persons will show streptococci present, but there are many cases of infection from milk cited, by different authorities.

Our high infant mortality, we know, can be traced in great measure to the feeding, the greater number of deaths occurring among bottle-fed babies. Such cases can be divided into three classes; first, cases of improper feeding ending in malnutrition and marasmus; second, cases of cholera infantum due, I believe, in most instances to toxine produced in the milk by numerous miscellaneous bacteria, and thirdly, a large number of deaths among babies is due to infection of the alimentary tract caused, I believe, many times by milk derived from cows suffering from mastitis and containing virulent streptococci. It is for these reasons that I think producers who put such milk on the market should be punished, I don't mean the small store dealers and such who are unable to determine infected milk, but the large milk contractors. These all have bacteriological laboratories and it is within their means to determine such milk and prevent it going to the market.

Within the last month the Boston Board of Health summoned to court two of the largest milk contractors in the city. They were found guilty of having infected milk for sale and each paid a fine. I think most health officials have been sort of timid about citing contractors to court on the finding of pus and streptococcus in milk but it has been done and they have been found guilty.

MEDICAL INSPECTION OF SCHOOLS.

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Read before the Massachusetts Association of Boards of Health, October 29, 1912.

The interest which the state takes in the health of its citizens finds its latest expression in the care of youth. Healthy children and young people must of necessity remain possessed of this same vigor when they become adults. Theory is supported by facts, as, for instance, in New York City, where in 1866 the average age at death was twenty-seven years while now it is forty-three and the annual death rate has decreased from thirty-five to less than sixteen per thousand. This is during the existence of the present health department. *The gain has been chiefly in the early age periods.*

Throughout the civilized world education is to a large degree compulsory. Few things so much interfere with the school work as sickness. Hence, there has always been considerable coöperation between health boards and educational authorities. The latest move in this direction is in the medical inspection of schools.

Undoubtedly the primary object of this inspection was to lessen the incidence and to prevent the epidemics of so-called contagious diseases. In more recent years, however, hygienists, having given much attention to the health of factories, stores, mines and various other places of adult occupation, have come to appreciate the importance of the school buildings. Typhoid fever, tuberculosis, malaria are found to be preventable, and so, too, may be many of the deformities and defects of development of early life. There has, therefore, appeared a much wider field of medical inspection which must nowadays include not only the consideration of contagious diseases, but also a study of all the children from the point of view of health and physical perfection. These United States, England, Canada, Germany, France, Norway, Sweden, Switzerland, Portugal, Japan, are the countries which have in a measure at least entered upon this broader field of medical inspection. The interest appears to be more general in England than elsewhere. Nearly every issue of the great English medical journals contains reports and papers along this line.

In this discussion, the broader subject of "school hygiene," so closely related, has been only touched. Books—many of them very good ones—have been written upon that. But the subject is here limited.

We assume that the medical inspector is a well-educated physician. He must be interested in hygiene, in education and in children. Lacking in either of these he will not succeed. Hygiene, treating of "the laws of

health and the methods of their observance," has not in most medical schools the prominence which it has at Harvard, nor has it always been accorded that position there. But will you find even in those great laboratories this broader field fully taught? Can one learn there all that one may need to know in regard to food, sleep, exercise, physical culture and mental training in order to wisely guide children? His interest in education will lead the medical inspector to a true estimate of the relative importance of the various portions of this study of children. Manifestly school routine must not be interrupted for reasons that are purely speculative. On the other hand, studies or methods of study which are physically harmful must be wisely limited or adapted. A real interest in children will give the medical inspector the same success in his work which the same quality gives to the teacher. Work that is merely dull routine—a method of earning one's living—will not in either case be of the highest value.

But can such men be obtained? Not in large numbers until the pay is made adequate. While cities and towns continue to expect medical men to do this work for a nominal pay from purely philanthropic motives no great general advances will be made. Here and there a man possessing the qualifications and training and with independent means will do a great work.

Our first plea, therefore, will be for properly equipped medical inspectors, adequately paid.

For convenience we use the masculine pronoun in this paper. But we believe that in many places, especially wth older girls, as good, or even better, work can be done by the female medical inspector and do not wish to appear to exclude her from this branch of medical work.

Only to a limited degree will the work of the medical inspector depend upon the location in which he works. Mankind generally, children everywhere, are pretty much alike. He will concern himself first with the communicable diseases. Smallpox, scarlet fever, measles, German measles, chicken pox, diphtheria, poliomyelitis, tonsilitis, whooping cough, mumps, pediculosis, scabies, ringworm, impetigo contagiosa, trachoma, venereal disease, tuberculosis, influenza, will be promptly detected by him, their isolation for a suitable period advised and readmission allowed upon full recovery. This work demands entire accord between the medical inspector and the health authorities of the community. He will also certify to the vaccination of the pupils. In most cases, the inspector is forbidden to give directions for the medical care of these children whose exclusion he advises or requires. This is because of the attitude taken by the family physicians who are jealous of any such intrusion within their special province. But it seems as if ambulatory patients with mild infections may soon come to the school physician for advice when parents desire it and thus the work

will be unified because diagnosis will be followed by treatment, as should be the case in medicine.

Secondly, the medical inspector searches out remediable defects in the scholars under his supervision. Here will be noted defects of hearing, vision and speech, of breathing, posture and growth, of walking, standing and sitting, of the teeth, the lungs, the heart, the skin, the nervous system and the circulation. This involves, as you will see, not alone a careful study of the child busy in school, but also a thorough physical examination. Moreover, the observer must be an "all around expert," that rare individual who is so apt to be "Jack at all trades, and master of none." This has led to the employment—wisely, we believe—of oculists, aurists and dentists to supplement the work of the regular inspector. True, he may perfect his knowledge and technical skill so that he will be able to tell surely whether the eyes, nares, pharynx, eardrum, or teeth need treatment or not, but few besides the specialists are wise enough now. The importance of this phase of medical inspection can hardly be estimated. Everywhere, when made, the examinations have shown very large percentages of these defects. Seventy-five per cent. of children show some defect! Teachers may be able to say that a child does not see well or hear well. But the reason is quite out of their province. The education of many a boy or girl has been rendered difficult or even entirely stopped because he could not see or hear the instruction as the other children did. The loss to the community in money wasted in attempts to teach such a child and in the future untrained mind which so readily becomes criminal is untold. Judge Mack said, "There is a straight road from adenoids to the penitentiary" and all the first part of this road is within the school life. Kyle's statement that 90 per cent. of those having adenoids are more or less deaf shows where the difficulty begins. Inability to hear is discouraging. Speech is limited and mental development is thereby stunted. Called a stupid child he soon becomes vicious. Defects of vision are in this state noted by the teacher who makes an annual test. There seems no good reason why this should not be done by the medical inspector or better by the oculist. Of 2,000,000 English children who were thus examined, 10 per cent. were found to have defective vision. Dental decay is readily noted in most children. Authorities differ as to the best measures for prophylaxis but agree that prompt skilled treatment is imperative. Neglect means deformity of the jaw, inefficient mastication, sources of constant supplies of toxic material and foci of disease which may even threaten life. A full set of sound teeth is a health asset to the adult not possible of computation, and is to be secured only by early care of the permanent teeth. Indeed, this has been so positively recognized that in many places already school dental clinics have been established, where dentists, paid for all their

time, care for the teeth of the scholars. It is said that one dentist can care for the teeth of three thousand children in a year.

Whether the medical inspector is assisted in these problems by the specialists or not, he will find plenty of other work at his hand. Removal of hypertrophied tonsils and adenoids still leaves the necessity of special training and other measures to meet the underlying hypoplastic condition. As the child sits at his study the trained eye may detect anæmia, malnutrition or spinal curvature. As he walks in marching, a limp may tell of a defect of foot, leg, thigh, hip, or spine. As he goes through gymnastic drill there will also appear defects of the trunk and upper extremities. Posture tells much of the weakness of groups of muscles and unless these muscles are properly strengthened permanent deformity results. All of this and more will appear if a full physical examination is made. Evidently the trend of the movement is in that direction. A record of such a physical examination showing height, weight, nutrition, condition of heart, lungs, spine, glands, joints, muscular development, nervous equilibrium, and besides these, the reports of the specialists, would be of great value as a guide to the removal of all remediable defects. There will be a few cases of heart disease thus detected and a still less number of pulmonary tuberculosis. But this information in these cases will be of the utmost importance to the health and even to the life of the child. Thirty-five out of every hundred who die of tuberculosis die between the ages of fifteen and thirty. This fact alone would show that the medical inspector of school children must ever keep this disease in mind, even though he will see few frank cases of it. Malnutrition and anæmia among the poor have in many cases yielded to the healthful school lunch which serves not merely as a supply of good food, but also as a concrete example to the child of the food he ought to have. The detection of muscular weakness allows for the recommendation of suitable exercises and the prohibition of others which under the circumstances would be harmful. There will be found nervous children who stutter and who will always have that impediment unless trained early. Habit spasms may be seen and now and then a case of petit-mal or even of grand-mal. Eneuresis, too, which rarely meets any consideration from the teacher, will be recognized and its treatment suggested. Occasionally a teacher will refer a case of thigh-friction, horrified that any such thing can be possible. Mild chorea will be at once detected and severe cases prevented. Rhachitis, suggested perhaps by superficial observation, is proven or disproven by the physical examination.

There are practical objections to such a complete examination, it is true. The time and labor involved are considerable and the expense is proportionately large. In favored communities the important defects thus discovered are few—we are not at this point speaking of the eye, ear, nose, throat and teeth which are almost as frequently affected among the well-to-

do as among the poor. In cities children are continually moving from one school to another, thus preventing their observation through any consecutive number of years. A large proportion of the records, therefore, will be of no value after the first. Germany's paternalism may make such a record of physical condition of real advantage to the state. But so far it apparently has not done so, for of the German youth who were examined for military service last year, nearly 50 per cent. were rejected. In America the people will not endure any such limitation of liberty to live where and as they choose.

These objections have led many authorities to adopt a system which is not scientifically complete or exact but full enough to allow the medical inspector to give immediate advice to evidently defective children.

Thirdly, the medical inspector will note the irremediable defects, physical and mental. Such are cripples not amenable to surgical treatment, the blind, the deaf and the mentally deficient. The teacher readily recognizes the defect and in most cases diagnoses correctly.

But the properly trained medical man alone can be sure of the exact condition and say whether relief or cure is possible. If not, he should also know the place the child can be made most fully self-supporting or the methods which must be used to bring about this end. Again, is the demand for expert knowledge not usually a part of the physician's equipment and emphasis is again laid upon special preparation for this work. There are schools for crippled children, the blind, the deaf and the mentally defective. Here, and here alone, can such youth be made self-supporting. Yet even the medical profession are but little informed about it and the general community looks upon such compulsory training as contravening personal liberty. Only very recently has the obstruction which such children furnish to the regular process of education of others been recognized. Some of these are border-line cases and the medical inspector alone will detect them. Though few in number, the saving to the community in their proper care might easily pay all the expense for adequate medical inspection of the schools. Two hundred and fifty thousand children are said to drop out of the schools of the United States because of physical disabilities each year. To hold a large per cent. of these will be one great result of medical inspection.

Fourthly, the medical inspector will conserve the health of the children whom he finds well. Exclusion of contagious cases, gradual restoration of defectives to normal health, removal of permanent defectives to more suitable training schools, do all lead to the continuance of the well child in health. But there are other phases of this part of his work and these at once lead into the larger realms of school-hygiene. Scholars are influenced not alone by the health of other pupils, but also by the health of teachers, by the air space, heating, ventilation and lighting of the schoolroom, by the

seats and desks, by open air rooms and outdoor classes, by clothes racks, by drinking water, by school lunches, by clean floors, by the relative amounts of "reading, writing and arithmetic," to say nothing of the score or more of other subjects in the curriculum, by the length of school sessions and study periods, by the amount of home studies, by habits of standing and walking and of sitting while reading or writing, by the calisthenic drill, by their sports and games. With regard to all these points the medical inspectors may be expected to have well-founded opinions and to give advice. Of course he must recognize the position of others who are equally concerned in the education of the child, but he must stand firmly for the prime importance of health, without which education is of little value.

"The health of the people is the supreme law" and in no way can this general healthfulness be more promptly effected than through the children in the schools. This desire to influence the community through the children may lead to their instruction by the medical inspector. Health lectures, especially if aided by the visual impressions to be derived from charts and stereopticon pictures, may be easily one of the most valuable services a medical inspector can render. Especially does this seem to be true of tuberculosis and of matters of sex hygiene now so much in the public eye.

This outline presentation of the subject of "Medical Inspection of Schools" clearly shows the opportunities for such work. There remains one topic which demands at least a word. What shall be done? In many communities disease and defects have been discovered by the medical inspector but nothing has been done to remedy those conditions. Manifestly this is a great waste of effort. The school nurse is a real aid. Part of her work is preliminary to that of the doctor at the school, but most of it is supplementary. In some places she is allowed to examine throats and teeth, make cultures or even clean teeth. Usually, however, her work is at the homes, to follow up the children there and if possible secure treatment. Many a child is taken by her to the dispensary or hospital, whose parents would never attend to the condition. As a social worker, too, she exerts a direct powerful influence on the health of the home which is not less important to the health of the child than the health of the school. School dental clinics in England are fairly numerous and so successful that general school clinics have been established in many places. Some of these are in hospitals or dispensaries already existing. Others are in the school buildings. It would seem that in these and in these alone can the 70 per cent. of carious teeth, the 30 per cent. of diseased tonsils or the 20 per cent. of adenoid obstruction be remedied. Certainly this next step must be taken and taken soon, or else the careful work of the medical inspector will be much of it useless, his interest will necessarily lag and the community will suffer.

45 Kilsyth Road.

Discussion.

Doctor Gallivan. One can hardly speak of medical inspection of schools without almost unconsciously mentioning the name of Doctor Durgin. It is a matter of history that Boston was the first city in this country to introduce medical inspection of schools as far back as 1892, and it has been carried on down to the present time under his guidance and support.

I am very glad that Doctor Hastings alluded to the requirements and conditions in his paper as being ideal, because as he read it the thought came to me how much time would be left for educational pursuits.

The recommendation to employ specialists to conduct these examinations and to establish clinics in the school buildings for the correction of defects does not appeal to me. It has yet to be proven that the people of Boston are so utterly devoid of parental instinct and parental responsibility as to be entirely oblivious of their offspring and their welfare.

On the other hand, comparing this year's physical examination with the physical examination made in 1911 of 2,000 children, we find 70 per cent. of the children are without defect as against 35 per cent. reported without defect in 1911. Comparing this list still further, we find that corrections have been made during the past year as follows:

Defective nasal breathing	54 per cent.
Cervical glands	50 " "
Defective teeth	40 " "
Hypertrophied tonsils	42 " "

Statistics dealing with such small numbers may not be of much value, but it is encouraging to note that parents in Boston are able and willing to care for their children once their attention is called to conditions which require treatment. The widespread prevalency of physical defects among school-children of all classes does not call for the usurpation of the parents' obligations. The average citizen is not supposed to be versed in medical, dental and hygienic affairs, about which no effort has been made until the present time to provide information: and the present system, as being carried on in Boston of informing parents of defects, of explaining to them the necessity of having these defects corrected has an educational value which warrants the prediction that the future pupils will enter school far better equipped physically than their predecessors and for the present seems all sufficient.

Doctor Chase. Mr. Chairman, I have spoken once; I will speak once more in order to discuss this question. I can echo what Doctor Gallivan said in ascribing credit to our chairman, Doctor Durgin, as the pioneer in this movement of medical inspection of school children. He confided to me just before he put it into operation the splendid plan of medical inspection for the Boston schools. Being a smaller place than Boston we in Brookline were able to start at just about the same time as Boston started with the school inspection, and we have kept it up ever since.

I shall not touch on all the subjects that my colleague, Doctor Hastings, has spoken of to invite discussion, but he has spoken of the great importance of the coöperation of specialists in making the examinations and repairing the defects found in school children, and especially the help we get from the dental profession and the specialist in the throat, nose and ear. As you well know, of the 65 or 66 per cent. of children in Boston who have physical defects requiring treatment, some 87 per cent.—Doctor Gallivan will correct me if I am wrong—have defects needing treatment, have defects in their teeth or in the throat, nose or ear, and therefore the importance of those specialists I mentioned, dental and throat, nose and ear.

In Brookline, for the past six or seven years, we have had the active assistance of Professor Potter of the Harvard Dental School in supervising our dental inspection, the actual work being done by four young dentists, and we have had three excellent throat specialists to help us about the throat, nose and ear inspection. Our difficulty, however, has been in

getting the repair work done. In the past year, largely with that in view, some of us here were able to get through our town meeting a vote carrying an appropriation of $2,000 a year for a hospital relief fund, and we most of us had in mind that dental repair work would come under the head of surgical relief as much as relief in the case of a broken leg or any other branch of surgery, but the lawyers tell us that we would require special legislation to have that go through. We got our $2,000, however, but we are not permitted to use a cent of it for dental repair work, neither can we use it, we are told, for repair work in case of enlarged adenoids or obstructed breathing or hypertrophied tonsils. But we are going to persevere until we can have that work attended to and make our inspections bear more practical fruit than they have in the past.

In our fresh air schoolroom, which we had last year in Brookline for the first time, we put the children in sleeping bags, much as they do in some of the Boston fresh air schools. We feel really a little proud of the success of the school. To have a basis for comparison I weighed each month the children in the fresh air schoolroom, then the children in another room, a closed room, so-called ordinary schoolroom, fairly well ventilated, where the children were of the same age, from the same neighborhood and the same economic conditions at home, and each month we saw the gain in the fresh air schoolroom. The children were not picked out, it was the regular second grade primary in each room, and the comparison was very favorable indeed to the fresh air room children. The teacher, who had broken down in health every year before the end of the summer term, this year, for the first time, went through without a single day's sickness.

ON THE PREPARATION OF ENDO'S MEDIUM.

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Several years ago, one of us (K) began the use of Endo's medium for the isolation of the typhoid bacillus from urine and feces and, it was often observed that the colon bacilli were often inhibited or that they were fewer than was the case in other media used as controls. The media was always prepared in accordance with the directions as given by Klinger[1] and great care was exercised in the neutralization. Yet despite these precautions, the above mentioned facts were often observed. As a media for the isolation of the typhoid bacillus, it is all that could be desired; but was not so good for the colon group when it was desired to know the total number present. It was found after considerable experimentation, that this media could be made as sensitive and as reliable to isolate the colon as the typhoid bacillus. The trouble was due to the variations in the index of alkalinity, which had a considerable range. While this did not seem to effect the growth of the typhoid bacillus, or others of this group, it did the colon group and that the media to give the most satisfactory results must be standarized biologically rather than chemically.

We have been using this media now for the past two years in the examination of milk to determine the colon group content and have found it everything to be desired; in fact it is indispensible.

We therefore wish to briefly describe the methods of preparation and standardization of Endo's media which has given such excellent results.

It is always better to make the media in considerable quantities, say in lots of 6, 8, or 10 liters. The amount of agar can be reduced to 2 per cent. instead of 4 per cent. as originally given.

Peptone, Witte	80 grams.
Meat Extract (Leibigs)	80 grams.
Salt	40 grams.
Agar-agar powdered	160 grams.
Water	8,000 c.c.

Mix the peptone salt and agar with sufficient water to make smooth paste, and then add the balance to make 8,000 c.c. Add the meat extract and, without attempting to mix this, place in an Arnold sterilizer and steam until all is dissolved; this usually requires about an hour.

When it is melted it is then cooled to about 55° C. and titrated to +1 using phenopthalein as an indicator. It is then placed in tall beakers, steamed for an half hour and then allowed to solidify. This is best done

[1] Klinger, Arbeit, d, Kais. Ges. Amt. 1906 pp. 52.

by allowing the beakers to remain in the sterilizer over night. In the morning a greater part of the precipitate will have gravitated to the bottom The solidified agar is removed from the breakers, placed on paper and all the precipitate is cut off and discarded. The rest is cut in small portions, replaced in the breakers and melted. It is then allowed to cool down to about 55° C. and standarized in the following manner:

Eighteen lots of 10 c.c. are placed in an equal number of sterile test tubes and these tubes are divided into two series; one the "acid" and the other the alkaline. To the "acid" series, are added the following amounts of $\frac{N}{HCl}$, viz: .01, .03, .05, .07, .09, .1 c.c. To the "alkaline" series, the following amounts of a $2\frac{1}{2}$ per cent. solution of sodic carbonate is added, 0, .01, .03, .05, .07, .09, .1, .3, .5, .7, .9, c.c. Then to all these tubes, and while hot add to each 1 c.c. of a 10 per cent. solution of lactose C. P. (crystal) 1 c.c. of a $2\frac{1}{2}$ per cent. solution of sodium sulphite, freshly prepared, and 1 c.c. of a half saturated alcholic solution of basic fuchsin. Pour, then, contents of each tube thus prepared into a sterile petrie dish and allow to harden. The surface of each plate is inoculated with a typhoid and colon bacilli from a 24-hour-old bouillon cultures; one half of the plate streaked with typhoid, and the other with colon. The plates are incubated for 24 hours and the one showing a typical and luxurious growth of both typhoid and colon is selected as a standard for the stock, and the alkali or acid is added to bring the stock to the selected index.

We have found it most convenient for routine examinations to divide the stock media into 100 c.c. lots and employ for this purpose a round bottle holding 120 c.c. which has been marked to 100 c.c. The bottles are filled up to the 100 c.c. mark and then sterilized in the Arnold for an hour for two successive days. It is then stored. When the media is used, it is melted; 1 gram of lactose crystal is added and as soon as dissolved 5 c.c, of a 5 per cent. solution of anhydrous sodium sulphite (freshly prepared and hot) is added and followed by 1 c.c. of a half-saturated alcoholic solution of basic fuchsin. All these are thoroughly mixed when it is ready to pour into plates. For determining the colon content in milk by the direct method, we have found it to be of advantage to employ a petrie dish of 150 m.m. diameter and pour into the plate sufficient of the media to cover the surface and allow this to harden. Then the milk is pipetted directly on the media and just enough of the media is poured in to mix with the milk, so that when it hardens the milk will be held in a thin layer of the media. This procedure will not only prevent spreading, but allows the colon colonies to produce their characteristic reaction within a shorter time than would occur otherwise. In case the media is employed to isolate the typhoid bacillus from dejecta the same procedures are observed as set forth in the original papers. We have found that a 2 per cent. agar answers every purpose and a 4 per cent. agar is not necessary.

METHODS IN EDUCATIONAL HYGIENE.

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Read before the American Public Health Association, Washington, D. C., September, 1912.

It is conceded that as a nation, we have not valued health as a personal or a national asset. We have been too busy tunnelling mountains, conquering space, boring for wealth, erecting sky-scrapers, piling up vast fortunes to count the cost in terms of human vitality. To make nature in her most forbidding aspect the servant of man has been almost a universal aim. Equally, to control the industrial features of a growing country has been the desire of those ambitious to gain power through wealth. Large ideals—some commendable,—but by no means the highest, when human happiness and human misery are involved..

In the evolution of the national life, this temper of mind was simply the logic of events. Its development was as inevitable as the French Revolution, the Civil War between the states, or any historical incident.

The signs of an awakening to a realization of both the economic and spiritual worth of health is likewise a logical consequence. Intelligent appreciation of the ultimate develops with advancement in other lines and the curve of progress shows that successive ages either have laid the foundations for reforms or built upon an inheritance; not uninterruptedly, but with increasing purpose. "The thoughts of men are widened with the process of the suns," not alone in commercial activities, but, if more slowly, quite as surely, in ethical and spiritual lines of human advancement.

The first stirring for better things hygienic, is due in part to the development of the science of medicine in various aspects and in part to the evolution of a socialized conscience yet in its swaddling clothes.

The first essential in any line of human endeavor is a scientific basis. For work of definite character in hygiene there is at hand a proved body of principles, the long result of time and research. In the promotion of public health this is fundamental. Given this necessary element, it becomes an obligation of civilized intelligence to apply the principles, remedial, preventive and constructive to habits of the people and their standards of health.

In the term Educational Hygiene, the facts and the application are implied. Methods relate to practical means to make concrete the knowledge and bring to the individual and the community a realization of its value. This discussion will be limited to the presentation of conclusions formed in two years of active work.

No educational method is worthy the name which is not founded on

psychological principles. Equally, to be effective, it must be adapted to conditions. Psychological principles and adaptability are concomitants, but often in practice the one or the other is lost sight of. Leaders forget that methods must "fit the world" or they are ineffective. It follows "the world" as a factor must be analyzed. As there is toward health, on the part of the masses, a common point of view this is easy.

The public attitude is negative. "Men have died and worms have eaten them" since the world began. It is inevitable. "People die when their time comes." To seek to prevent sickness "is sheer nonsense"; in fact, it is "flying in the face of Providence," it is "unorthodox," it may be "sinful." To lengthen the term of human life and stamp out diseases which have persisted always is only the dream of the faddist and like many other "exploded" so-called scientific theories, well-meaning, but a mistaken and futile effort.

Then if these new-fangled sanitary measures cost less, it might be well to permit experiments. But for the large amounts needed, who can show a return in dollars and cents? If investments are made in reclaiming swamp areas there is the land as an asset, but the draining of large sections as a preventive of malaria is not a "paying" investment.

These few statements crystallize the thoughts of many who come to hear "what the health doctor has to say" and to see (if he happen to have a traveling exhibit) the "new kind of show."

This prevailing impression that nothing can be done to remedy conditions and that "experiments" cost too much is the outcome of ignorance of the science of health and the practical value of these principles. It is a logical state of mind. It is not to be expected that the public should know, or even believe, many of the wonderful truths so recently brought to light.

Therefore, in patience and magnanimity, in the spirit of service, the medical apostle must preach and teach the "Gospel of Health."

As an offset to the feeling of indifference, even of distrust, there is in this country, a receptivity to new ideas, if acceptably presented. In this lies the opportunity.

Conviction that science has put its finger on the cause of many diseases must be brought home to the individual mind; further, that to know the cause is to know the remedy, and that it is to the advantage of all to apply the knowledge, whether it be in the giving of serum or the rehabilitation of a city.

In addition, economic results for money expended must be plain.

It is acknowledged that the public mind is now in the pictorial stage.

The spectacular catches; hence, exhibits, photoplay outfits, working models, pictures, charts, posters, wall cards and illustrated pamphlets are popular. Traveling exhibits in trains, automobiles, on electric trucks

and wagons have the advantage of novelty, but they are expensive and adequate equipment in these is impossible.

Exhibits have the advantage of attracting all classes, and, when complete with reference to a specific subject, they are effective.

For example, a collection of models, pictures and charts illustrating principles of oral hygiene shown school children undoubtedly impress and make converts for the toothbrush habit. Differentiated unit exhibits naturally follow those more complete.

Literature written in a popular style is one of the best methods of educating what may be called the newspaper class. But the style must be simple and original. It has been interesting to note the "hit" made by the parody on Mary's Little Lamb.

Methods which recognize the importance of the school as an agency for the dissemination of knowledge and the acceptation of new principles are in the foremost rank of excellence. Pictorial material wisely selected is helpful. Instruction given to children of different grades is most effective if well done.

Psychology indicates that much cannot be accomplished with adults whose habits of thought and action are established. With the young, it is easy to impress principles and induce activity. Discretion is important, however, in the presentation of health facts because of the imagination of the child, the vividness of its impressions and the possible after-effects.

Right here, it is worth while to say that instruction in hygiene in general, is very much below the standard attained in other subjects. The reasons for this are too numerous to discuss. Suffice it to say that text-books on this subject are better than those formerly brought out and that there is a dawning conviction that the teaching should be made practical. However, it is common, even yet, to go into a room with poor ventilation, perhaps, with windows and doors closed and find the teacher giving a lesson in hygiene from a book. Presumably the text has a chapter somewhere on the value and content of pure air, but if read it has not carried home the truth that, of all places, the schoolroom is the one where a generous supply is absolutely necessary.

The facts presented by the school physiology are important, but the elements of hygiene have far more effect in the daily life of the child.

Presentation of practical truths through the eye by illustration and literature and by instruction in the schools are methods which appeal largely to the individual.

Community methods should be identical in principle. One of the best is sanitary inspection. The purview of this division includes the fundamentals of community life, namely, water and food supply, street cleaning, garbage collection and disposal, pollution of streams, sale of drugs, abatement of nuisances and condition of public buildings.

Sanitary inspection, attacking as it does things vital in general welfare,

brings an immediate response. For example, an inspection of over four hundred bakeries revealed the fact that one hundred and eighty-seven of the employees needed a bath and clean clothing. One of the men volunteered the information that he had not had a bath nor a change of linen for six days but that that was "scrub night." Reports of the bakeries given to the papers and sent to the proper authorities resulted in a general cleaning. Windows, doors, walls, floors, troughs, trays, were cleaned, and in a few instances screens were installed. Many more satisfactory improvements were made which included rearangements and better facilities, and, for a time at least, cleanliness of employees was made obligatory.

The condemnation of every slaughter-house in a town of 25,000 inhabitants worked a hardship on the people, as cold-storage products, higher in price than home-slaughtered meat, had to be purchased. But the result justified the summary order as one entirely new slaughter-pen was erected and the others brought up to the standard required by the Sanitary Code. It took several weeks; and criticism was not lacking, but the community approved the method.

Inspection of a thousand grocery stores in the rural districts in Louisiana has eliminated from the shelves of these establishments, and others of like type, many harmful patent medicines. Perhaps no feature of the statewide campaign of 1910 with the health exhibit train was more productive of good than this special effort.

Any improvement, however slight, becomes an object lesson, if nothing more.

The education of the people, always a concomitant of systematic inspection work, is worthy of consideration. Reforms suggested by the health officer are met with apathy, indifference or hostility. The reason is plain. The majority are ignorant of the propagating agencies of disease, even of the danger from careless handling of food products. This ignorance of immediate danger is the basis of hostility. Inspection, touching as it does the supplies needed daily in the home and the necessities of the community, gives opportunity for explicit instruction in the principles of hygiene and exposition of the causal and propagating agencies of disease.

It is a stimulus to activity on the part of individuals and the community.

Medical inspection in the older and established form meant care of contagious and infectious disease with the related problems of public health. While this obtains as a division of all health boards, there is a newer phase, equally as important and more far-reaching in effect, namely, examination of school children.

Two functions are recognized, inspection for the detection of communicable diseases and examination for physical defects. Records from these cities, incomplete and inadequate as they are, show an appalling need for systematized and coöperative efforts on the part of educational and health authorities in this field of endeavor.

In some cities more thorough physical and developmental inspection has been introduced and in a very few the "follow up" system has been inaugurated. The nurses employed are used as social educators. To instruct parents and induce them to avail themselves of medical and dental clinics, if unable to pay for special aid or treatment, are specifically the duties of these trained school nurses.

Modern educational hygiene implies many activities beyond examinations of this character. There is marked need of phychoclinical investigation of abnormal children, the supernormal, and those in different stages of arrested development. There is also need for skilled investigation of the physiologic, anthropologic, sociologic and hereditary problems underlying conditions of mind and body of the various types of children. The biologic requirements of the child in its different periods of development is another phase of this work of investigation and determination. These investigations are full of possibilities and suggestions, not only for the correction of defects, but for the conservation of physical health and mental power.

Inspection, preventive, remedial and constructive, is a potent agency for the application of the principles and the popularization of every practical phase of educational hygiene.

All efforts for the betterment of physical conditions, whether personal or environmental, are constructive, the aim being to substitute the hygienic for the unhygienic, the sanitary for the insanitary.

Health is an individual problem, but it concerns the social unit as well. The larger activities of health work involve the economic and social factors that underlie labor conditions, housing and whatever features of personal or community life make possible inefficiency, lowered vitality or disease. With the removal of these defects fundamental in the social order there would be possibilities for work distinctly constructive which would make for resistance to disease, better physical life and all that is implied. At present this phase of health work is illustrated in the science of eugenics, distinctly constructive in character.

But the day of an established hygienic order of this character is distant. In the meantime the apostle of public health must be content to fit methods to conditions and keep in mind that the world is more and more because a few are vouchsafed the "vision."

Education in the elemental principles of hygiene is the lever which will lift the masses to higher health levels. Methods must embody these primary truths. The appeal will reach only through adaptation to former experiences. The school is the best medium for instruction of the individual, the influence reacting on the home and ultimately on the community.

It is common sense to face the fact that we are yet in the elementary stage in sanitary progress. It is wisdom to attack the essentials, not with the hope of complete immediate regeneration, but with the realization that all reforms pertaining to habits of thought and living are wrought not in a day or in a generation, but slowly through the increasing purpose of the ages.

THE PROLONGATION OF HUMAN LIFE.

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Health Officer, Detroit, Mich.

Read before the American Public Health Association, September, 1912, Washington, D. C.

The title of this paper might lead anyone to think that I am the discoverer of some new serum, which, when injected into the body, will have the marvelous effect of prolonging human life. Such is not the case, however, and it is merely my purpose to call your attention to some things which have much to do with the preservation of health and the prolongation of life. None of the suggestions that I have to make are new, but it is my desire to emphasize the need of putting into practice some of our own teachings. Much has been said in the last year or two in various conventions and meetings of this kind about eugenics, and the subject has been discussed from a great many angles. The teaching of eugenics is a step in the right direction, but the putting into practice of this teaching is the only thing that will bring about satisfactory results. In order to prolong life, then, our first step must be to look after the baby before it is born, so to speak. We must see to it that the parents come from proper ancestry, and that they themselves are fitted mentally and physically to be parents. I have not the time, nor is this the place, to discuss the many ways in which this can be accomplished, but I do want to call attention to one necessary step, and that is a proper marriage law and one that can be enforced, to prevent men and women from entering into the marriage state while they are suffering from any contagious disease. The enforcement of such a law alone would, in many cases, give the child a better start in life than it has today. The best work that is being done for the prevention of infant mortality is the pre-natal work, so-called, which consists, as the name implies, in looking after the baby before birth by giving proper care and attention to the mother. Many other similar steps can be taken besides the two that I have mentioned in the practice of eugenics, all with the same result, that a healthy baby will be born of healthy parents. The next thing in order for the prolongation of human life is to keep the well baby in good health. This is being done in many cities today, and the number is constantly growing. The problem of the prevention of infant mortality is one that is receiving much attention with the result that the deaths in infancy are being very much reduced and lives are daily being prolonged all over this country beyond the first year, before which time many of them have been sacrificed in the past.

Another trying period of life is from infancy to early childhood, say from one to five years of age. During this time many children die of commu-

nicable diseases; but the number is not as large as it was formerly because of the efforts of organized Boards of Health in this respect. It seems to me, however, that the education of the public looking towards the prevention of all manner of diseases during this period of life has been somewhat neglected. Boards of Health care for cases of communicable diseases after they have made their appearance and do what they can to restrict the same, but a step in advance w uld be for health officials to do work similar to that which is being done for the prevention of infant mortality by sending graduate nurses into homes to teach people how to keep their children well after they have gone beyond one year of age. I am very strongly of the opinion that the best public health work can be done through the agency of the trained nurse, and that by using her on every possible occasion for the purpose of educating the public, much can be done toward the prolongation of human life.

After the child becomes of school age, the state takes control of it to to the extent of requiring its attendance at school, and of late years in most places the state is doing its duty in looking after the health of the school child by a supervision of school buildings and a medical inspection of school children with a view of giving them every possible protection. The examination of all school children for physical defects and the correction of the same is an important factor. Especially is this true as it applies to the correction of defective eyesight and hearing, defective teeth and the correction of pathological conditions of the nose and throat. By means of a system of dental inspection done by dentists and a correction of the defects found, either by private dentists, or in the case of indigent children, by publicly paid dentists in dental clinics, probably the most lasting good is accomplished. The general health of the children is improved and they are taught dental hygiene, which teaching remains with them throughout life and aids greatly in preserving their health.

Another thing that should not be overlooked during childhood and adolescence, is the teaching of sex hygiene. It is an open question, and one which I will not at this time attempt to answer, whether this teaching should be given to the pupils in the schools, or whether it should be administered only by the parents. Whatever may be the answer to that question, the fact remains that children should be taught enough of the physiology and hygiene of the sexual organs to understand the question, and they should be told enough of the prevalence and horrors of venereal diseases to aid them in living moral, upright lives. My own opinion is that this can best be accomplished through the parents or possibly through the family physician. There can be no question but that the teaching of hygiene in general, with special stress laid upon personal hygiene, should form part of the curriculum of all schools before the high school grades are reached. Some states have laws with such a requirement, but the courses

offered in most instances are not sufficiently thorough and comprehensive. During school age, children should be taught how to live in every respect; they should be taught the value of proper exercise, good nutritious food, pure air and proper habits. An education along these lines will be of better service to our children in after life than a mere superficial understanding of the problem of algebra and higher mathematics.

We have now looked after the child from the time before it was born until it starts out in life and is supposed to look after itself. By looking after one's self most people mean the earning of sufficient money to pay for one's daily bread, but looking after one's self in this discussion should include the protection of one's own health. In other words, all men and women who are self-sustaining, and who are not receiving instruction from their elders in this respect, should learn to value their health as their best asset. To do this, they need the aid of a conscientious and careful physician. It has been my preaching for several years, and I desire to emphasize it now, that every person should submit to a physical examination by a competent physician several times each year. How frequently do men, busy in life with their many affairs, find out by an examination on the part of a medical examiner of some insurance company, that they have a disease of the kidneys. This, like many other pathological conditions, comes on insidiously and does not give the victim any particular warning, but the training and knowledge of the skilled medical practitioner enables him to find out that the disease is approaching before it has had an opportunity to do much harm. It is, therefore, necessary that the examination referred to be complete in every detail, so that the earliest symptoms of any possible disease may be detected, and the disease process arrested at once. It is up to the doctors, it seems to me, to bring about this practice of preventive medicine among the people, and it is certainly up to the members of this Association. Most mothers have learned to call in a physician to tell them how to keep their babies well before the babies become diseased, and to some extent they are pursuing the same tactics as applied to their older children, but they themselves assume that they are well so long as they are able to be about and attend to their many duties. Why should not the mother and father demand the same attention for themselves that they are asking for their children? Incipient Bright's disease can be arrested and life prolonged by attention to a proper diet and mode of life. The same can be said of diabetes, and we know, if we know anything in medicine, that tuberculosis in its incipient stage, at a time when it is not recognized by the victim, is a curable disease; at least curable to the extent that the pathological process can be arrested, and the patient's life indefinitely prolonged as far as this disease is concerned. There are many other conditions, which, if allowed to go on without attention to the rules of personal hygiene, will become worse and end in early death, whereas they may

be to some extent corrected, and to a great extent arrested, if proper attention is given them.

There can be no question but that Boards of Health and sanitarians everywhere are trying to awaken the public to the facts which I have enumerated, but in order to make their work more effective, they should have the assistance of the medical profession as a whole, and particularly of those members who are not directly connected with public health work. If the family physician of all the people will teach them the good to be obtained by their practising personal hygiene, it will not be long before the scope of human life will be considerably prolonged.

EDUCATIONAL PUBLICITY IN OFFENSE AND DEFENSE.

HOYT E. DEARHOLT, M. D.

Executive Secretary, Wisconsin Anti-Tuberculosis Association, Milwaukee, Wis.

Read before the American Public Health Association, Washington, D. C., September, 1912.

Supply and Demand.

There are 92,000,000 people in the United States consciously or unconsciously struggling for the best obtainable health and the longest possible lives.

Science has determined the cause of nearly all communicable diseases and demonstrated that they are preventable. And communicable diseases are *not* prevented to any great extent and there is manifest no remarkable lessening in the death rate. That is a reasonably accurate presentation of the public health situation in this country today, is it not?

On the one hand, there is a demand for life and health assuring facilities equal to and exceeding the visible supply. On the other hand, the visible supply is not being utilized to any great extent, and the storehouses are full to overflowing. That is likewise sufficiently accurate to serve as a simile, is it not?

If one were to lay the above situation before a successful merchant in terms of his own experience, and ask him what was wrong, he would undoubtedly snap out the queries,—"Have you advertised? If so, have you done it well? Is your shop well located and are your windows attractively arranged? Are your salesmen and saleswomen courteous, and are they doing all they can to help the purchasing public to get what is actually wanted, however it may be asked for?" By the time one had answered those questions honestly and frankly, a clearer picture in a little more detail of the public health situation would have been set forth.

A manufacturer similarly approached would desire to know if the product was honestly good, and the price consistent with the actual worth. Satisfied that good judgment was used in the purchase of raw materials, that skilled workmen were engaged in their fabrication, and that there was no extravagance in the factory management, he, like the merchant, would turn to an analysis of the sales organization.

Supplying the Demand.

The sales organization, in the sense that the term is used here, is the force which operates between the producer and the consumer; that popu-

larizes the product, stimulates interest, desire and demand, and actually negotiates the transfer.

However exalted the parentage may be held to be, sanitation is a useful art and an applied science, honorable and honored in direct proportion to the extent it is utilized and practically applied.

The sooner sanitarians come to a full appreciation of the fact that public health is a utility, and to a frank admission or boast (if you please) that it is their function to create a purposeful demand and to supply a useful and, therefore, valuable product, the sooner will that honor and respect, which is essential to the prosperity and success of the project, be given by the pulic.

In whatever respect we may hold the inventive genius of Edison, a very superficial study of the power of this remarkable man will demonstrate that his ability to popularize his conceptions and inventions has been of infinitely more importance in the development and progress of his work than have been the conceptions themselves. Without the patronage of the public, the phonograph (to choose one of the inventions, for example) would remain more or less a crude, scientific laboratory curiosity, instead of a well-nigh mechanically perfect and easily accessible source of much enjoyment, culture and education.

The development and practically universal application of the moving picture apparatus has called for a higher degree of sales organization. It serves to illustrate a more complex coöperation and coördination, made necessary by inherent complications in the problem of bringing producer and consumer or patron together.

The thousands upon thousands of miles of expensive copper wire, the remarkably perfected instruments, the costly buildings and the millions of dollars worth of stock certificates and bonds, offer visible and palpable evidence of the people's willingness and eagerness to finance and utilize such a conception as was represented by Alexander Bell's original crude, cumberous and troublesome exposition of a telephone.

Pasteur's Proposed Enterprise.

And what has come to the infinitely more marvelous, infinitely more beautiful, infinitely more useful, conception of Pasteur,—the conception that "it is within the power of man to cause all germ diseases to disappear from the earth?"

Isn't it perfectly patent, that it has, in a measure at least, gone the way of many great inventions,—that it has been, for a time, under the cloud of bad business management? When a business or an industrial enterprise is found to be out of balance, when operation ceases or fails to be as profitable as faith dictated it should be, it is customary to take stock, to balance debits and credits, in short to call in a business doctor, if home

diagnosis and home remedies fail to bring about the improvement that prevents or postpones the funeral service in the bankruptcy court.

If there is any serious internal disorder in public health administration it must be removed or corrected before our enterprise will go far or fast. It is, however, with the externals, the front that is turned to the public, that I have chosen to confine the discussion of this paper, believing, even, that a healthy, sound, substantial interior must be present or acquired to permit of a lasting good appearance.

Promotion.

For the welfare of the enterprise, let us, as rapidly as possible, throw affectation into the scrap heap,—let us do away with the terms "love of humanity," "good of mankind," "disinterestedness," etc., and make a frank avowal to the public that we are promoting a business for providing better health and longer lives; that we are going to make that business grow to be as big and as profitable as possible; and that as success comes we shall expect a fair wage for the efficient management. Instead of breeding criticism and suspicion, this will, in great measure, allay that which is already present and common enough.

Financing.

Capital will be furnished in proportion to the degree in which the promotion is well or poorly conducted. It must be borne in mind, and due allowance made therefor, that the investing public (in this instance, the taxpayers and their financial agents and directors: legislatures, county, city and village boards) has, in the past, made many unprofitable investments and is right to be sceptical.

Operation.

By adjusting scope to capital, and by employment of that initiative, ingenuity and resourcefulness which characterize the building of successful enterprises of any character, accomplishment, however modest, so long as it is proportionate to outlay and operating expense, will insure further capital.

Sanitation has passed the experimental stage. Wood in Cuba and Gorgas in Panama, and a few sanitarians in the United States, have demonstrated practical operation and enormous dividends. With slight modification and adaptation to local conditions and needs, their success can be duplicated in every commonwealth, city, village and township in the country.

Insuring Confidence.

After the enterprise is launched or reorganized, it is to be expected that development will, for a time, consume or warrant the postponement of

dividend payments. Obviously, the stockholders will be eager to know that their investment is safe, that their hope for profit has not been another phantom dream of avarice.

The success of the enterprise, at this time, hangs in the balance. Proper publicity, correct explanation, the creation of comprehensive understanding, will insure confidence and stability. Expansion and extension from this time will be entirely a matter of mathematics and capacity.

While a mistake is commonly made in trusting too little in the interest and intelligence of the public, there is also danger in trusting too much. The truth is, that while there is no stronger instinct than the love of life and health, there is, in the helter-skelter life of today, no end of divertisements. And this is where the science and art of exciting and maintaining the interest and support of the public holds the balance of power.

Publicity Media Analyzed.

The oldest form of advertisement is by word of mouth, which is expressed today by lectures, personal argument and boast. The next is by symbolic and pictorial representation, survivals of which are still to be seen at some inns, livery stables and all barber shops. It was the discovery of the art of printing which gave knowledge, information and curiosity a new meaning and boundless opportunities.

The best means of popularizing the health movement are afforded by the lecture, the exhibit, pamphlets and booklets and the daily press. The best results will be obtained by a judicious and balanced employment of all of them. The technique of their employment is best acquired by a critical analysis of the advertising methods of the most successful, privately owned business institutions. In an enterprise of any considerable magnitude, there will be opportunity for the exercise of the entire time and best effort of an expert or a corps of experts.

If time and your patience permitted, I should like to exhibit good and bad examples of public health publicity, for the positive and negative suggestions they offer. Instead, a comment or two on the more important publicity media must suffice.

The Press.

This is an age of tremendous competition in spite of anything the "Trust busters" may tell us. Nowhere does this competition manifest itself more pointedly than in the struggle of "news" to pass the editorial blue pencil or waste paper basket.

A worthy cause alone is not enough to secure and control a sufficient amount of valuable newspaper space to popularize and materialize a sanitary Utopia. While newspaper editors have displayed a most generous and patient toleration, there must come a time when they will refuse to

longer jeopardize the paper's reputation for enterprise by publishing inspired but tedious, prosy and amateurish essays.

Etymology justifies the editor's contention that the newspaper's function consists in printing "recent intelligence of something that has taken place." The sense of public responsibility possessed by nearly every editor, however, makes easily possible his connivance in the publication of old facts needing frequent expression if—mind the "if"—they are put under the guise of news and in a "style" which is in accord with the general make-up of the newspaper.

Between the hours of 2.30 a. m. and 2.33 a. m., the style of the medical society essayist or of the contributor to the *Atlantic Monthly* does not excite the enthusiasm of a nervous, overwrought headline writer and impel him to dig the salient catch line out of a paragraph somewhere toward the end of the article and transpose it into eighteen letters and spaces at the head of a column.

The editor gladly pays for interesting and suitable "stories," suitable and suited to what his experience and judgment lead him to believe his readers want. He will pay the competent public health educator well in generous space, good positions and unsolicited editorial comment, for the real service and the real assistance that will shorten his daily grind of "copy."

The Exhibit.

For elementary instruction, exhibits take the place in public health education that alphabet blocks and the more advanced Froebel and Montessori methods do in the mental training of the young. They entertain and instruct. The more ingeniously devised they are, the more they will prove to be both instructive and entertaining.

Cartoons and Graphs.

The Cruikshanks, Nasts and McCutcheons have undoubtedly left as deep an impress upon history as have the Wessleys, Phillips and La Follettes.

Keen, well-conceived and cunningly devised cartoons on evil sanitary conditions, particularly when pointedly contrasted with more or less beatified and rose-tinted sunshine pictures, are calculated to sink into the consciousness and mould the habits and taste of the public for which they are calculated.

It isn't the art or the draughtsmanship which carries the cartoon. On the contrary,—correct detail and too nice a sense of exactness will frequently mask or distort the fundamental image.

Leaflets and Reports.

There may be a place for somber faced, listless, illy composed, smudgilly printed reports and public health preachments. With the great mass of other recipients, I'm impelled to say that it is in the waste paper basket. The pity is that so many efficiency purchasing dollars should be invested in scrap paper.

When one's mail contains beautifully illustrated, attractively printed, insinuating literature on breakfast foods, silk stockings, irrigated orchard projects, and 100 per cent. dividend investment prospects,—who is it that is expected to extract a possible interesting fact out of the typical health board publication?

A well-edited, mechanically clean, smooth running, four-page pamphlet will do more purposeful work than a volume of flat statistical tables stitched inside a shroudlike cover.

The Lecturer.

The lecturer, like the newspaper correspondent and the pamphleteer, must be prepared to engage and overcome uncompromising competition. Nowhere is technique, originality and resourcefulness put to a more severe test. This is undoubtedly the most costly form of winning the attention and coöperation of the public. When this is considered, the expenditure of a few extra dollars and sufficient time to attract sizable audiences and good press reports for the "stay-at-homes," is not alone warranted but imperatively demanded.

Conclusion.

In conclusion, let me say that, while in publicity, as in any other technical work, inordinate self-interest and vanity may for a time pass counterfeit, sooner or later a trial balance of quickly convertible assets and unavoidable liabilities must be struck.

Taking the public into full partnership in the public health enterprise offers tremendous opportunity to the strong man in the health office. The other kind will do well to lie low and attract as little attention to himself and his work as is possible.

MASSACHUSETTS ASSOCIATION OF BOARDS OF HEALTH.

Abstract of Proceedings. Quarterly Meeting.

The quarterly meeting of the Massachusetts Association of Boards of Health was held at the Brunswick Hotel, Boston, Tuesday, October 29, 1912, Dr. Samuel H. Durgin, Vice-President, presiding.

On the recommendation of the Executive Committee the following new members were elected:

Dr. John S. Carroll, Lowell Board of Health.

Prof. Selskar M. Gunn, Massachusetts Institute of Technology.

Thomas J. Donnellon, Boston Board of Health.

W. A. Bense, Canton Board of Health.

Samuel Myer Schmidt, Boston Board of Health.

Reports of Committees.

Doctor Slack presented the following report:

Report of Committee appointed at April Meeting to consider the question of proper regulations concerning the leaving of milk at homes where there are infectious diseases.

It is the opinion of the committee that the rules now in force for the care of milk bottles at homes where infectious diseases exist are insufficient for the following reasons:

1. Where vessels are set out at the customer's door they are liable to contamination from dust and from animals, and the removal of caps from bottles by drivers is also liable to contaminate the milk.

2. Families often do not comply with the notification of the Board of Health to set out receptacles, and in such cases the milkman is apt to leave bottles, contrary to the board's regulation, since if he does not do this he loses his customer.

3. The burden of enforcing the ruling is thus placed upon the milk dealer, who often does not enforce same on account of causing offense to customers.

4. There is no provision in the present rule for controlling bottled milk bought from stores.

The following regulations are recommended:

1. That Boards of Health permit the delivery of milk in bottles to houses in which infectious diseases may exist.

2. That milk dealers as at present be informed of the presence of disease.

3. That a special notice to milkmen be posted at the milk-service doors of houses informing the milkman of the presence of disease, and

ordering him to remove no bottles from said location until the removal of the card.

4. That the medical inspector or visitor from the Health Department give instructions to householders to keep all milk bottles brought into the house until the case is discharged by the Board of Health. Such bottles to be properly cleansed and stored until released by order of the board.

5. Upon release of infected premises from quarantine, inspectors of the Board of Health shall cause all milk bottles to be disinfected before returning to the dealer.

6. That a penalty be attached for any person found violating these regulations.

F. H. Slack, *Chairman.*
Charles K. Whiting.
Sumner T. Coolidge.
W. P. Coues.
George E. Bolling.

(On motion, the report was accepted and placed on file.)

Mr. Bolling presented the following report for the Legislative Committee:

Report of Legislative Committee.

The Legislative Committee wish to report that they are in favor of introducing a bill at the next session of the Legislature calling for the establishing of a standard for cleanliness in milk intended for sale.

For a great many years we have had on the statute books of Massachusetts a law fixing a standard of milk as regards the amount of solids and butter fat it must contain. This law did not specify that a man must keep so many Jerseys, so many Guernseys, so many Holsteins, and so many brindle cows in his herd in order to reach a certain standard, it simply fixed a standard and told the producer to get milk that would reach it. So there is a growing feeling that as regards the production of clean milk a voluminous law treating with specious detail is unnecessary, but what is needed is the establishing of a definite standard of cleanliness.

The following is a draft of a bill which must be regarded as tentative only as changes may be made before it is submitted to the Legislature:

Sect. 1. No person, by himself, or by his servant or agent, or as the servant or agent of any other person, firm or corporation, shall sell, exchange or deliver, or have in his custody or possession with intent to sell, exchange or deliver, any milk which contains more than 500,000 bacteria per cubic centimeter or any pathogenic organism.

Sect. 2. For the purposes of this act the number of bacteria in milk

shall be deemed proportionate to the number of colonies developing when one cubic centimeter of the milk diluted 10,000 times with sterile water is placed in a Petri dish of 9 to 10 centimeters inside diameter with nutrient agar of 1.5 per cent. acidity and incubated for 48 hours at 98.6° Fahrenheit.

SECT. 3. For the purposes of this act samples of milk may be taken by such officials as are authorized by existing law.

SECT. 4. Any one violating Section 1 shall be notified of the offense and if three consecutive samples, taken at intervals of not less than 3 days be found to contain bacteria in excess of 500,000 per cubic centimeter he shall be subject to a penalty of not more than fifty dollars.

SECT. 5. It shall be the duty of officials enforcing this act to inform any person violating the same of means that may properly be taken to diminish the number of bacteria in milk.

GEORGE E. BOLLING, *Chairman.*

(On motion, the report was accepted and placed on file.)

Papers Presented.

The following papers were then read:—

Housing Problems, by Thomas Jordan, Boston.

Some Practical Considerations on the Presence of Leucocytes and Streptococci in Milk, by James J. Scannell, M. D., Boston.

Medical Inspection of Schools, by Robert W. Hastings, M. D., A. M., Brookline.

(These papers are printed elsewhere in this number.)

Further Business.

It was moved and seconded that the Association go on record as endorsing the bills suggested by Mr. Jordan in his paper, and urge upon the Legislature of 1913 their passage. The motion was carried.

It was moved and seconded that the Legislative Committee be directed to introduce such a bill as they have reported at the next session of the Legislature in regard to establishing a standard for cleanliness of milk. The motion was carried.

BOOK REVIEWS.

Infantile Mortality. *Report of the Special Committee appointed by the Council of the Royal Statistical Society to enquire into the systems adopted in different countries for the registration of births (including stillbirths) and deaths with reference to infantile mortality. London: Royal Statistical Society. 1912. Price one shilling. Pp. 61.*

This report is of timely interest, especially for the United States where much attention has been devoted of late to the question of obtaining adequate registration of vital statistics. Knowledge of infantile mortality is of fundamental importance in public health work and the recently organized Children's Bureau of the Federal Government is given the task of making special studies of infant mortality and birth registration in this country, although, to our disgrace, there is scarcely a state or city in the United States in which fully dependable figures for births or infantile mortality are available for any extended series of years.

The value of the investigation undertaken by the Royal Statistical Society is assured by the constitution of the special committee, which was composed of Dr. Reginald Dudfield (chairman), Sir William Cospatrick Dunbar, Sir Shirley F. Murphy, Mr. C. P. Sanger, and Dr. T. H. C. Stevenson. It was found necessary to extend the original scope so that it "practically covers the whole system of registration and the calculation of vital statistics." A questionnaire was sent to 133 registration officers in various countries, states and provinces, and replies were received from 103. The information received requires to be supplemented by data from official publications, and the particulars relating to certain states of this country are not in all instances correct;[1] nevertheless, the report as a whole is well worth careful study by all interested in the adoption of better methods of collecting and compiling vital statistics.

A brief sketch is given of the history of registration, followed by a discussion of the practice of registration in general, stillbirths, and statistical methods. "Registration" is divided into two acts, "declaration" and "inscription." No special study was made with respect to the responsibility for declarations, but the prevailing practice is that of England in which the primary duty is placed upon the father and mother of the child, for births, and upon the nearest relative, for deaths. In the United States the medical practitioner or midwife is required to report births, a practice which "assimilates closely to that under the Notification of Births Act," and the undertaker is primarily responsible for the filing of the certificate of death.

Under efficiency of registration, it is stated that "the answers dealing with this subject, convey, with comparatively few exceptions, opinions that registration is very fairly complete—in the more settled countries at least. Registration of births is, perhaps, on the whole less complete than that of deaths, and that such should be the case is probable

[1] As an example of the difficulty of ascertaining the precise conditions, it is stated in Table E (p. 50) under the head "What data are used for calculating birth and death rates?" that seventeen out of the nineteen American states replying to the question employ the "Numbers registered." This is contrary to the Rule of Statistical Practice adopted by American registration officials, "Total deaths should include all deaths that occurred in the given area during the period stated in the table, and no others." The question that elicited the information was: "In compiling statistics of births, stillbirths and deaths for any period, do the births, etc., relate to the numbers occurring, or to the numbers registered during that period?" Upon inquiry, it appears that the reply "Numbers registered" merely meant, in the great majority of cases, that the compilation was based upon births and deaths returned as the results of registration, in distinction from estimates of the numbers that may have occurred and, in part, have escaped registration, and that the births and deaths compiled in the report for a given year were those that actually occurrred during the year, not the number registered or reported during the year. Weekly or monthly bulletins may relate to "deaths reported" or "births reported," but not annual reports as a rule.

from the apparent lack of facilities for tracing births. Registration of births is admittedly incomplete in the majority of the individual states of the United States of America. Further, registration both of births and deaths is incomplete in countries having a colored population (*cf.* India, Orange Free State, etc.)." In the table in which the replies to the question "Do many births or deaths escape registration!" are presented, the replies for the United States do not appear very creditable in contrast to the definite negative or very slight margin of incompleteness presented by foreign offices. California answers "A few," with a note that "Hardly any deaths escape registration, but birth registration is probably incomplete, especially in unsettled or sparsely settled rural districts." The District of Columbia admits a deficiency of 5–10 per cent. of births; Connecticut, "about 10 per cent.;" Maine, 10–15 per cent.; Maryland, 40 per cent.; Massachusetts, "a few;" Michigan, "not many;" New Jersey, 0–20 per cent.; New York, 0–10 per cent.; North Carolina, "We think not;" Texas, 45 per cent.; Rhode Island, "not many;" Wisconsin, 10 per cent. The reply from North Carolina must have been under misapprehension, as the state has no law whatever for births and that for deaths at present applies only to municipalities of 500 population and over, in some of which the registration is incomplete. Not much dependence can be placed upon percentage estimates of efficiency, a very usual estimate being "90 per cent." even in the case of grossly incomplete returns.

Confusion is introduced into the statistics of infantile mortality by the varying methods of different countries with respect to the definition of stillbirths. In Belgium, France, Holland, and Spain the "stillbirths" include a proportion of children born alive but dying before registration. "It does not appear to be very material," in the opinion of the committee, "what registers are used, so long as statistical tabulation is uniform," and the following conclusions are presented:

(1) That it is desirable that an international definition of "stillbirth" should be adopted;

(2) That stillbirths should be registered; and

(3) That where the definition of "stillbirths" does not exclude from such category the births of children born alive but dying before registration, official inquiries should be instituted on the occasion of registration with a view to discriminating between such forms of pseudo stillbirth (Bertillon's *dit mort-né*) and the genuine (*mort-né*).

The Chairman also presents, as a base for future discussion, the following definitions of "stillbirth" and "stillborn:"

"A stillborn" child means a child born after a period of gestation of not less than seven lunar months (28 weeks) whose heart has ceased to function before the whole of the body (including the head and limbs) of such child has been completely extruded from the body of the mother; and

A "stillbirth" means the birth of a stillborn child.

The committee lays stress on the usual definition of infantile mortality as the "ratio of deaths during the first year of life to births" and feels that the method, employed in a few countries, in which the estimated number living at ages under one year replaces the births is "most unsatisfactory and even illusory." It concludes with the following recommendations:

(1) That stillbirths should be tabulated separately, such tabulation to include, *if necessary*,

(*a*) the number of children born alive but registered as dead, and

(*b*) the numbers born in each successive week or month after the prescribed (earliest) time for registerable stillbirths;

(2) That for general use the infantile mortality rate should be calculated from

(*a*) the births of children born alive, including, *if necessary*, those born alive but registered dead, and

(*b*) the number of deaths of children born alive during the first year of life, including, *if necessary*, the children "presented dead."

This question of the definition and statistical treatment of stillbirths, which is necessary to secure uniformity in the statement of living births and of deaths, has been considered carefully by American registration officials as shown by the proposed resolutions printed in the *Quarterly Publications* of the American Statistical Association, December, 1907. Among the resolutions adopted by the American Public Health Association, at Winnipeg, 1908, as Rules of Statistical Practice[1] were the following:

Rule No. 18.—Birth (completion of birth) is the instant of complete separation of the entire body (not body in the restricted sense of trunk, but the entire organism, including head, trunk, and limbs) of the child from the body of the mother. The umbilical cord need not be cut or the placenta detached in order to constitute complete birth for registration purposes. A child dead or dying a moment before the instant of birth is a stillbirth, and one dying a moment, no matter how brief, *after* birth, was a living child, and should not be registered as a stillbirth.

Rule No. 19.—No child that shows any evidence of life after birth should be registered as a stillbirth.

Rule No. 20.—Stillbirths should not be included in tables of births or in tables of deaths. They should be given in separate tables of stillbirths.

These rules have been insisted upon by the Bureau of the Census in its instructions to state and city registrars for the return of births and deaths, and may be found in the Manual of the International List of Causes of Death which is used by them as a guide for statistical compilation. At the recent meeting of the American Public Health Association at Washington, September, 1912, it was proposed to give additional precision to them and to define the lower limit of uterogestation, below which stillbirths need not be registered. A special committee was appointed, the chairman of which is Dr. Charles V. Chapin of Providence, to report at the next meeting.

It is very gratifying that the rules adopted by American registration officials and the recommendations of the English committee are so closely in agreement, and it is to be hoped that international statistical practice will conform to the suggestions for a uniform and precise statement of stillbirths, by means of which some of the present difficulties in making exact comparisons of infantile mortality will be obviated. It is, of course, most important that stillbirths should be registered and studied on their own account, and it is surely time that Great Britain and the British colonies, in which for the most part stillbirths are entirely ignored for registration purposes although they are reported in England and Wales under the Notification of Births Act, should take steps to bring up their statistics in this respect to a level with those of other countries.

Cressy L. Wilbur.

Nutritional Physiology. *By Percy G. Stiles, Assistant Professor of Physiology in Simmons College; Instructor in Physiology and Personal Hygiene in the Massachusetts Institute of Technology, Boston. 12mo of 271 pages, illustrated. Philadelphia and London: W. B. Saunders Company, 1912. Cloth, $1.25 net.*

Stiles' new book is a concise treatment of the chief divisions of human physiology from the steadfast standpoint of nutrition—of energy transformation. It is not a compendium of tables of calorific food values and practical dietetics for old and young.

Digestion and nutrition, *per se*, naturally constitute the bulk of the book—about two thirds. The remaining third is devoted to the other departments of physiology, the nervous system and muscles and glands preponderating, while a chapter apiece is given to temperature regulation, internal secretion, and alcohol. Obviously an admirably balanced distribution in view of the author's stated aim and plan. Special

[1] See Census Bulletin No. 108, Mortality Statistics, 1909.

mention should be made of the Alcohol chapter as a classic—a model of sound, impartial treatment.

The form of presentation puts the book in a class of limited membership. The author appears to be master of a style of fine simplicity which interposes no screen of muddy language between the reader and the subject-matter. Difficult points are revealed by forceful and ofttimes quaint similes from common experience, but great care is taken to point out the limitations and possible weakness of each analogy.

The subject-matter appears to be scrupulously precise and up-to-date. The unusual combination of soundness and clarity makes the book useful for layman and scientist and particularly for students in elementary physiology and household economics.

It is difficult to criticise unfavorably on such a delightfully *rara avis* in scientific presentation. But in the reviewer's opinion one of its faults lies in one of its claims to virtue—the use of illuminating analogies. The student, ofttimes, is relieved of the necessity of overcoming any obstacles whatsoever. The reduction of needed mental effort to a minimum is not an unmixed blessing from the point of view of developing the student's powers.

Eugene C. Howe, Department of Hygiene and Physical Education, Wellesley College.

"Fresh Air and How to Use It." *by Thomas Spees Carrington, M.D., New York, The National Association for the Study and Prevention of Tuberculosis, 105 East 22d Street; 250 pp.; 150 illustrations; cloth; price, $1.00 postpaid.*

The right kind of a book comes to the public at the right time. Doctor Carrington has produced such. People in cities, in villages and in summer resorts are appreciating fresh air, outdoor sleeping and living and are inquiring; their first inquiry is as to how it may be made available in their different localities. On the Shawangunk Mountains of Ulster County may be seen numerous sleeping loggia like the pictures on pages 186 and following. The illustration on pages 121 and 204 show three of the seven open air balconies in one block in New York City.

Doctor Carrington's book is of special value in showing how odd corners may be made available for balconies. It is also valuable in the details of dress and management of cases unaccustomed to living outdoors and wishing to learn the safe method.

Doctor Carrington knows his subject and has written clearly and fully, besides he has amply illustrated the text by the use of well-selected photographs.

Inquirers may look to this book with the assurance that it will answer all questions.

W. P. Northrup.

The Prevention of Destitution. *By Sidney and Beatrice Webb. pp. 348. Longmans, Green and Co., 39 Paternoster Row, London. New York, 1912. $2.00.*

The Prevention of Destitution, which is the summarization and popular presentation of the minority report of the Royal Commission on the English Poor Law, is a book which deals with public health problems in the deepest and broadest social sense, and from that standpoint should command serious study on the part of all those interested in constructive and preventive health measures. The book emphasizes the more modern public health idea: that conception which reaches beyond exact science and the laboratory, and includes in its scope social and industrial reconstruction, educational and philanthropic efforts for human betterment, and all attempts at economic readjustment.

However much one may differ with the Webbs as to the significance of destitution in its causative relation to public ill-health, everyone will be forced to admit that it is an important factor. The first chapter, which defines destitution as "the condition of being without one or other of the necessities of

life, in such a way that health and strength, and even vitality, are so impaired as to eventually imperil life itself," further treats it as a disease of society. The etiological factors in this social disease may be sickness or invalidity, death of a breadwinner in a family, old age, imbecility, incapacity, unwillingness, etc. In a chapter which deals with sickness and destitution the point of view is one of prevention, emphasis being laid on methods of attacking disease in its most incipient stage, on an improved public health service, on better sanitation, and on the utilization of all preventive measures, such as milk dispensaries, instruction of mothers and health visiting.

In a portion of the book devoted to human breeding there is discussed the relationship of eugenics to public health. Mr. Webb seems to belong to that wing of the still unorganized army of eugenists, where environment and training are considered of greater importance than any hereditary possibilities. He says: "We can alter the anti-eugenic breeding only by changing the environment which is responsible for it." He refutes that belated type of mind clamoring for the survival of the fit by the reminder that "where the rules of the ring favor a low type, the low type will survive."

Perhaps the most convincing chapter, least open to criticism, is the one on "Child-neglect." In an imaginary review before the king he depicts in striking terms the great national parade, made up largely of fairly healthy young men and women, but presenting, besides, a far too large proportion of anæmic, flat-chested, physically defective youths, cripples, blind, tuberculous, syphilitic, and criminals. A few of these are no doubt the result of evil inheritance, but most of the failures at twenty-one are made into failures either by neglect during the school years between five and fourteen, or by poverty and maladjustment after leaving school. The remedy lies, in part at least, in the further development of medical school inspection, of continuation evening schools, the latter not only for the better preparation it would provide the young for their entrance into the life struggle and the advantage that would result from some degree of state supervision at this period in their lives, but also for the increased opportunity it would give for the readjustment economically of unemployed adults.

The broad scope of the book is indicated by the space given to overwork or "sweating," underemployment and unemployment, and the effect of these agencies on social well-being. Mr. Webb points out that part of the population is earning barely sufficient to sustain existence; working hours of labor such as to make the lives of the workers periods of almost ceaseless toil; and under sanitary conditions injurious to the health of the persons employed, and dangerous to the public. Aside from the social and moral perversion of justice which this represents, it is from the narrowest standpoint of wealth production inconceivably short sighted. On the other hand, society is confronted with the great mass of underemployed or unemployed. Webb's analysis of the causative factors in this problem and the presentation of the remedial measures recommended are examples of keen social analysis and of socially constructive statesmanship.

The question of state insurance occupies more than sixty pages of the book. It is in this chapter that Webb takes a more critical and antagonistic attitude than elsewhere and it is here that many readers will be inclined to disagree with the author. His sweeping statement that insurance does not prevent is surely too broad for justification. Insurance, under a rational method of application, surrounded by the necessary safeguards, is undoubtably a preventive of much poverty and destitution. It is true, however, that sickness insurance is apt to be vicious, without an efficient public health service, and unemployment insurance may lead to imposition and pauperization unless associated with publicity bureaus and well-organized labor exchanges.

The chapter on "Voluntary Agencies" is an illuminating discussion of the advantages and disadvantages of voluntary charity. Perhaps the most positive and genuinely constructive part of the book is the section presenting the necessity for a new public of-

ficer, the "Registrar of Public Assistance." Finally, in the chapter on "The Moral Factor," Mr. Webb shows the magnificent spirit of the book, and of the author. He is one of those who believe that our evils are social ones, arising from maladjustment. He places prevention before relief, and the principles he advocates are curative, not palliative. He is pragmatic, somewhat of an opportunist, and perhaps worthy of the criticism so long directed at him and his earlier fabian associates. He may be considered by some a "Gawdsaker," which term H. G. Wells applies to those who constantly rush about exclaiming: "For gawd's sake let's do something." However, the emphasis he lays on education would indicate his belief that the comprehension of principles must precede a ceaseless activity. He recognizes the necessity for a community sense of direction, the awakening of a social consciousness, and a collective social and moral responsibility.

Donald B. Armstrong.

Ventilation from a new Stand-point.

British physiologists have devoted a large share of their energy in recent years to the problems connected with respiration. Leonard Hill is perhaps the most prominent of a group whose names are associated with fruitful studies in this field. It is therefore interesting to consider a summary of his views concerning ventilation. Such a statement in a condensed and popular form he has embodied in a presidential address before an English association and it has been reprinted by *The Popular Science Monthly*.[1]

The article reads like a stenographer's report and various slips of the tongue—or instances of careless proofreading—appear in it. These can be overlooked; though a New Englander resents the obvious confusing of the intellectual Laura Bridgman with the hapless defective known in physiological literature as "Strümpell's patient." The really important matter of the address can be divided into two parts—first, a review of the doctrines previously held and of the transition to current beliefs and, second, the considerations which are more distinctly the speaker's own.

The readers of this JOURNAL are so familiar with prevailing views that only the briefest statement need be made. It has been established that lack of oxygen is practically unknown under the worst conditions of crowding and restricted air-supply, so long as we are observing subjects at the sea-level or at ordinary attitudes above it. Hill points out effectively that in the most intolerable situations in shops, mines, or tenements the oxygen supply is more liberal than in the celebrated health resorts of the Alps. Increase of carbon dioxide to the percentage which clearly disturbs the human system is only the remotest possibility. In the light of these facts men of science turned for a time to the hypothesis of "crowd-poison" to account for the untoward effects of deficient ventilation. It was maintained that organic exhalations from the respiratory tract, the mouth, the skin, and the clothing must accumulate in the stagnant air.

Crowd-poison still has its protagonists but can be said, on the whole, to be in disrepute. Hill makes light of it. He recognizes, of course, that an odor in a stuffy room must have a chemical basis but he points out that such odors cease to be apparent to persons who continue to breathe the vitiated atmosphere. The assumption is made that the sensation completely measures the influence of the odorous material on the organism. This appears to the reviewer to be utterly unsafe. Crile has abundantly proved that central anaesthesia does not insure the neutralization of the effects of stimulation through afferent paths.

Hill fully endorses the teaching to which we have become accustomed that there are but two qualities in the air of ill ventilated places that are at all likely to make themselves felt, high temperature and high humid-

[1] Vol. LXXXI, October 1912, pp. 374-396.

ity. In fact, it might be claimed that only one of these, high temperature, need be considered. For high humidity is not significant in connection with moderate temperatures. Lack of movement in the air might be mentioned as another detrimental condition but this is really tributary to the two just mentioned. If there are no currents the air next the skin of the face and hands is not briskly exchanged for fresh portions and it becomes warm and moist. Hence, the surface of the skin would be as warm in a room filled with still air of a certain temperature as it would in another room where the mercury was standing several degrees higher but with the air in circulation. Hill is an advocate of the electric fan.

But we must pass to the more novel parts of the address. The speaker tells us that when the ideal of the architect and the engineer is attained—the older standards being sought—the result is far from satisfactory. The air of the work-room of the school is chemically correct, its temperature is 65° F., there are no draughts,—but the occupants are sluggish and depressed. Very likely they complain of the ventilating system. The cause of their dissatisfaction is, in a word, that the environment is *unstimulating*. We have been so anxious to eliminate disturbing factors that we have produced an unwholesome calm. The human body is not accustomed to the suspension of external stimulation; it has been developed under such spurring and tends to lose tone and efficiency when shielded from it.

If we analyze the effect of the absence of stimulation we shall probably be safe in concluding that one result is a vascular relaxation, presumably with some decline of the arterial pressure. Another is a softening of the musculature. Both these changes are such as favor mental passivity and scattering. They are characteristic of the approach to sleep. When we go to bed we aim more or less successfully to exclude stimuli of all sorts and we welcome the ensuing lapse through reverie to unconsciousness. But when it is our purpose to concentrate the attention we avoid absolute comfort. We do not resort to a hammock or a morris-chair. Hill affirms that when we have neutralized draughts and secured a mild, uniform temperature we have shut out possible promoters of nervous activity. He would therefore prefer that ventilating and heating systems should not work too well. A touch of chilliness and a perceptible air current he would regard as desirable. Certainly it is worth while to consider that the most comfortable climates do not produce the dominant races and we have perhaps pampered ourselves unwisely by approximating such climates in our homes.

There is a corollary to Hill's contention which might not be foreseen. It is that low diet makes people seek the lifeless air of ill-ventilated houses. They cannot meet the demands of more bracing conditions because they have no fuel to spare. The case of the Newfoundland fishermen is cited: they are so underfed that they huddle in warm cabins and the hardening effect of their laborious occupation is more than counteracted by the relaxation under shelter. They are dying at an appalling rate from tuberculosis. Here, then, we have a fresh protest against the doctrines of Chittenden. Hill maintains that colder rooms with air in motion will make us more hardy and alert, but that liberal feeding must be maintained to meet the tax upon the heat-producing tissues.

Percy G. Stiles.

PUBLIC HEALTH NOTES.

The Histological Lesion of Pertussis.

The recent investigation of this subject by E. B. Mallory, M. D., and A. A. Horner, M. D., is presented in the November number of the *Journal of Medical Research*. The work was based on the microscopic study of the trachea and lungs from three patients dying of whooping cough in the Boston City Hospital (South Department).

The lesion is characterized by the presence of large numbers of minute bacilli between the cilia of the cells lining the trachea, with a varying amount of apparent erosion of the cilia themselves, only stubs remaining in places. The same conditions are present, probably less frequently and consistently, in the bronchi and bronchioles.

The organism suggests strongly the bacillus obtained in pure culture in 1906, by Bordet and Gengou, which organism is generally accepted as the cause of whooping cough. It is gram negative and stains but lightly by ordinary methods. The reaction to the organism is slight, there being no necrosis of the cells, and no increased mucous. There is, however, a migration of polymorpho nuclear leucocytes to the region, with occasionally actively phagocytic endothelial leucocytes, while the submucosa shows a moderate infiltration with lymphocytes and plasma cells.

Although there must be the production of a mild toxin, as is shown by the leucocyte migration, by lymphatic proliferation in the nodes, by the general lymphocytosis, and by the production of an antibody which acts specifically toward the bacillus, yet Mallory and Horner conclude that "the action of the bacilli in the respiratory tract would seem to be largely mechanical. By their presence in such large numbers, dozens to a hundred or more between the cilia of a single cell, they must interfere seriously with the normal ciliary action and thus with the removal of secretion and of inhaled particles in consequence of which the lungs must be more exposed to infection by inhalation than under ordinary circumstances.

"The mechanical interference with the action of the cilia, and possibly their destruction, prevent the normal removal of secretion. The bacilli and the secretion produce a continuous irritation which results in coughing, and usually also in the characteristic spasm known as whooping."

Industrial Hygiene.

"It goes without saying that of all the matters dealt with at the recent International Congress on Hygiene and Demography, none is of more concern to the medical profession and to the public, than that of diseases of occupation. It seems that nowadays the acme of civilization is considered to be reached by the country which is most given over to manufacturing. As this country is in the van of civilization, so she is almost the most prominent in manufacturing. Although industrialism produces wealth, it does not produce health. In fact, as regards the worker it is an open question whether it produces either of these desirable possessions. With respect to health, it may be emphatically stated that industrialism is its greatest enemy. It draws people from the country to the cities where they too frequently live herded together like animals and under unsanitary conditions generally. The final result is degeneration and the production of a race inherently unhealthy."

The Dietetic and Hygienic Gazette, November, 1912.

Social Conditions in Montreal.

That Montreal is, from the standpoint of public welfare, a decidedly backward city, is the conclusion one must reach after reading an account of the Montreal Child Welfare Exhibition, described by Anna Louise Strong and Rufus D. Smith in the *Survey* for November 16. The health section of the exhibit dealt especially with infant mortality and its causes, and brought out the fact that Montreal has the highest rate of any of the North American cities—250 per thousand

births—this being not scientifically accurate, however, due to the lack of compulsory birth registration. The housing problem is a real one, owing to the presence of rear court houses, buildings sometimes standing three deep on a lot. "The density of population per park space is greater than any large city on the continent, greater even than that of crowded New York." The education question is also serious. There is no compulsory education, no school census, no free library; until just recently, no medical school inspection, and according to these writers, not even a complete list of the public schools in Montreal.

An investigation of several hundred employees brought out the fact that one third of them began work before the age of fourteen, so that the child-labor problem is also present in this northern city. The article further states that Montreal is without means for dealing with deficient children in the schools, and without accommodations for her mental defectives.

It is hoped that by exhibits and other educational measures there may be developed a public opinion strong enough along social lines to prevent or eradicate many of these social defects.

Gross Pathology of Rat Plague.

The gross lesions of rat plague, more fully described in *Public Health Reports* for July 26, 1912, may be indicated in the following way:

I. *Subcutaneous Injection.*

An engorgement of the subcutaneous blood vessels with a diffuse pinkish hyperæmia of the subcutaneous muscles, may be universal, bilateral, unilateral, or only about the primary bubo.

II. *The Bubo.*

May be auxillary, inguinal, pelvic or cervical. Gland varies in size, feels indurated and circumscribed upon palpation, but is caseous and easily shelled out upon dissection.

III. *Liver.*

Is yellowish in color, and studded with an enormous number of yellowish white granules, about the size of a pin head.

IV. *Spleen.*

Markedly enlarged, firm, friable, dark in color, occasionally presents small granules under the capsule, giving mottled appearance. May be slate colored.

V. *Pleura.*

An effusion, bilateral, usually serous, occasionally haemorrhagic.

Notification in Zurich, Switzerland.

A new enactment regarding infectious disease notification in Zurich is described in *Public Health* for October. Notifiable diseases are divided into two classes. Diseases under class A are smallpox, cholera, typhus, plague, epidemic meningitis and leprosy. These diseases must be reported by the head of the family if the doctor is not in attendance, and must be isolated in a fever hospital. Class B includes typhoid, food poisoning, measles, scarlet fever, diphtheria, open tuberculosis, diarrhœa, varicella, pertussis, puerperal fever, anthrax and glanders. These must be removed to a hospital when there is insufficient opportunity for isolation at home.

There are special regulations regarding tuberculosis. The disease is notifiable (a) when the case is in undoubted danger to the surroundings; (b) when there is a change of address of persons liable to notification; (c) in case of death from open tuberculosis.

Disinfection is obligatory in smallpox, cholera, typhus, plague, meningitis, typhoid, diphtheria, scarlet fever, diarrhœa, leprosy, or open tuberculosis. It may be carried out at the request of the health officer, or physician in whooping cough, anthrax and glanders.

A Health Survey.

Before the recent meeting of the Academy of Political Science, Dr. George T. Palmer recounted his experience in conducting a sanitary and health survey in the city of Springfield, Ill. In this investigation of sanitary and social conditions the chief problems studied are indicated in the following outline:

A. Typhoid Fever.

While the city of Springfield had recently spent $4,000,000 for a water and sewage system, and analyses from time to time had proven the water safe, they were confronted with a typhoid mortality rate of between 40 and 50 per 100,000 population. A very thorough study of 6,000 shallow wells and 7,000 adjacent privy vaults offered a certain explanation for this rate, and by compelling property owners to put in the city water the mortality rate for the following year (1911) was brought down into the twenties.

B. Housing.

An investigation of housing conditions resulted in a marked improvement in the tenements; lack of state laws, however, made satisfactory action impossible.

C. Infant Mortality.

Efforts directed toward the obtaining of pure milk showed results in a reduction from 68 deaths from summer diarrhœa in 1909 to 41 deaths in 1911.

D. Inspection of Restaurants and Bakeries.

E. Garbage Collection and Disposal.

Besides these direct investigations, the publicity associated with the work, and the public sentiment aroused stimulated to activity many agencies working for civic betterment. The net results of this manifold effort may be summarized as follows:

1. Lowered typhoid rate,
2. Lowered infant mortality rate,
3. Detention home for children,
4. A tuberculosis association with a dispensary and visiting nurses,
5. Medical inspection of school children,
6. County care for indigent consumptives.

Doctor Palmer's general conclusions as to the significance and effectiveness of the survery are, first, it is easier to bring about public health reforms in an American municipality than to secure any other kind of civic betterment. Second, jealous as the people are of their personal liberty, they have recognized the necessity of submission to inconvenience in the interest of the health of the community. Third, a sanitary survey is an entering wedge for any other kinds of moral, social and civic betterment. Fourth, civic problems in cities of 50,000 or 60,000 population are quite as definite, if not so extensive, as in cities of larger size. Fifth, perhaps the greatest value of a survey is the awakening of the people to the necessity for a more thorough knowledge of local conditions, and the creation of an attitude of insistance upon the improvement of these conditions.

Light and Air.

The Medical Officer for October 26 presents the criticism made by Dr. A. E. Harris, health officer of Islington, Eng., on some modern types of window construction, and quoted him further, as follows:—

"'Builders will find out by and by that people will discover, as already many have, that large windows with sliding sashes are the only efficient means for providing those two great necessities of life, good light and ventilation, without draughts, to keep the air of the house sweet and pure; and that the sliding sashes also afford far better means for regulating the supply of air than is furnished by the windows of these picturesque houses, which are better adapted for warm climates, where the people live with open windows nearly all the year round. In England, however, except in some very sheltered spots, they are not suitable.' Doctor Harris urges that light and ventilation are the two great requirements of men, women, and children, if they are to enjoy healthy lives, and that high gabled roofs, artistic dormers, French windows, and walls covered with beautiful creepers, cannot compensate for the lack of these necessities."

School of Eugenics.

"A school which aims to give to the teacher, the parent and the social worker a practical groundwork in eugenics has been opened in Boston," says the *Survey* for November 19. "The school is an outgrowth of lecture courses which have been offered in various parts of New England during the last five years.

Courses are offered in eugenics, euthenics, biology of nutrition and reproduction, genealogy, and sex in religion. The general

purpose of the school, headquarters of which are at 585 Boylston St., are stated to be, "to remove the ignorance and superstition which at present shrouds the subject of sex and reproduction, to dignify the function of parenthood in the estimation of both men and women, and to warn against race poisons and false traditions and practices which have come about by ignorance of nature's laws governing the function of race production."

Summer Resorts.

The sanitary inspection of summer resorts is an important measure from the standpoint, first, of the health of persons living in these places while on vacations; second, of the possibility of contamination from these resorts, of water supplies for other communities; and third, of the amount of disease acquired while away from home, which may be brought back to the cities by vacationists. The *Bulletin* (August) of the Ohio State Board of Health announces that the summer resorts of that state will, from now on, be subject to a sanitary survey, and comments further, as follows:—

"The importance of this work is, of course, very evident. Probably more cases of disease are acquired by individuals going away for summer vacations to resorts than are acquired at home. Many of these resorts are absolutely insanitary as has been shown by the investigations which have progressed to date. It is hoped that all health officials in the state will inform the secretary of the State Board of Health of any resorts in their immediate neighborhood, in order that this survey may be as complete as possible."

Welfare Work for Children.

Nature, through the maternal instinct, provides the animal with the ability to so protect its young that a fair percentage will usually survive. Human babies, however, in the opinion of Warfield Webb, as expressed in the December number of *Life and Health*, are too sacred to be reared on this basis. Human beings exist in a society and the social nature of human life should create an attitude of community responsibility, the result of which should be the education and protection of the mother not possessing the knowledge required in safeguarding the lives of her children. Many infants now die of preventable diseases, the result of ignorance, poverty, ill-health, insanitary environment, and other agencies, and the responsibility for this condition of affairs rests not only on the parents, but to an even greater degree, on the community. So far as society has come to recognize its obligation, there have come into being organizations of many types, attacking various phases of the evil. One such agency which attempts to give not only guidance to the mother, but the advantage of the doctor's and the nurse's assistance and training, is the day nursery. Here the infant is given care more beneficial than it could receive at home. Frequent examinations lead to the remedy of correctible defects, and the mother is taught how properly to feed, bath, exercise and provide for the sleep of the infant. Such measures may not attack the fundamental causes of infant morbidity and mortality, but in our present economic condition they are surely desirable and necessary ameliorating agencies.

How to Poison Rats.

In the *U. S. Public Health Report* for August 9, 1912, Assistant Surgeon-General Rucker, gave the following directions for the poisioning of rats, on a propholactic measure against bubonic plague:

"Get a loaf of stale bread, cut it into pieces about one inch square by three-quarters of an inch thick. Get a good rat poison. There are two chief kinds of rat poison on the market, one containing arsenic and the other phosphorus. You can tell phosphorus paste because it smells like a match head. Either one of these poisons is good, as it shines at night, and the rats like its odor and taste. A small quantity will kill them, and as it acts rather slowly, they go outside the house to die. If the poison used is too hard to spread easily on the bread, set the container is some hot water. Some pastes are thin enough so that this is unnecessary. Do not get any of the paste on your hands because it may burn the skin, and unless the hands are very care-

fully washed, the poison may be carried to the mouth by the fingers soiled with it. It is best to wear a pair of leather or rubber gloves when preparing the poison. Spread the poison on the pieces of bread with a knife. Be careful that all sides of the pieces are smeared with the poison. As fast as poisoned pieces of bread are prepared they should be put in a covered bucket, and when a sufficient quantity is ready, it should be distributed. Bear in mind that arsenic poison has the disadvantage that it does not deteriorate, and therefore it may be taken by some animal which it is not intended to poison a long time after it has been put out; also bear in mind that phosphorus is liable to spontaneous combustion, especially when put in a warm place or exposed to the direct rays of the sun. Phosphorus pastes which have glucose as a base are less liable to spontaneous combustion. Do not put the poisoned pieces of bread in the open because they may be taken by children or domestic animals, but put them in the rat holes where they cannot be gotten at by human beings or domestic animals. Then this is not practicable, get a small box and put small pieces of poisoned bread in a bowl, cover the bowl with the box, and bore a hole two inches in diameter in each end of the box. These holes are big enough to admit the rats and will keep out cats, dogs, and chickens. Keep track of every piece of poison put out; then after it has been out long enough you can collect the pieces of poison which remain untouched.

"Rats will not take poison in places where there is plenty of other food. Therefore to be most successful in rat poisoning the premises should be thoroughly cleaned and all foodstuffs protected from rats by the use of metal screening or metal containers. Garbage should be placed in water-tight metal garbage cans only. A starved rat takes poison quite readily."

Midwifery in Rural Districts.

An intensive investigation of this subject in Anne Arundel County, Md., by Dr. Mary Sherwood, is reported in the September number of the *Johns Hopkins Hospital Bulletin*. It was the first investigation of this kind to be conducted outside of the large cities, being carried out, in this study, in the rural districts, where the means of transportation are entirely by horse. It was found that of 119 midwives practicing in the county, 14 per cent. were American, 79 per cent. were colored, and 7 per cent. were foreigners. Two fifths of all the births are attended by midwives, while of the 119 only four had received any school training. The fees received average from $3 to $5. Although it is forbidden by law, practically all made vaginal examinations, and while a few professed to washing their hands with soap and water, many go unwashed directly from field labor to an obstetrical case. Only two midwives were suspected of criminal practice. None of them count the pulse, although one colored midwife stated that she always felt the pulse, giving as her estimate of the normal pulse, "about two."

Many of the practices admitted to were undeniably weird and might be considered ludicrous, were they not of such serious significance. One woman's treatment of hemorrhage was to burn a cloth in a stove; another gave her patient salt to hold in her hand as the treatment for delayed placenta; in another neighborhood *ante partum* douches were routine.

However, owing to the distances to be traveled, the small number of physicians and the smallness of the fees, most of the physicians, in the county agreed that midwifery was a necessary evil, and that the problem resolves itself into one of education. Further than this, the necessary training and equipment will have to be provided free by the state. In the meantime the local physician must be looked to not to solve the problem, but to palliate, as far as possible, the lamentable state of affairs, and to demand a closer supervision of the conditions existing in his community.

Doctors of Public Health.

Dr. E. B. Dresslar in the last bulletin of the U. S. Bureau of Education emphasizes the need for more doctors of public health, and according to the *Boston Transcript*

(November 14.) states his belief that "our system of paying doctors to do something for us when we are sick ought to be largely discarded for the Chinese system of paying them to keep us from getting sick." He points out the value of school inspection for children from the standpoint of the prevention of much transmittable, disease, and justifies this, and other forms of state supervision and control, on the ground of public policy. He says further: "Our chief duty lies in removing the causes which attribute to physical unsoundness and disease. As long as we herd our children in schools where they must breath impure sir, bend over unsanitary school desks, work at books when they need physical exercise, just so long shall we be paying for our own errors." We need health officers, "whose philosophy is based on the gospel of physical vigor, on the sanctity of personal purity, and the godliness of clean living; doctors of health in very truth who will be concerned with exhibiting not a long list of the physically defective and diseased, but a large list of healthy well-developed children."

Arsenic in Textiles and Wall-Papers.

In view of the fact that some countries have passed sanitary regulations prohibiting the presence of arsenic paints, varnishes, textile materials, papers, etc., some recent experiments carried out by E. L. Dove, M. D., of London, and reported in *Public Health* for August, 1912, are of interest. He examined forty-three textile materials, with thirty-four negative results, the Marsh apparatus being employed. Two cloths showed arsenic in 5 parts per million, three 2½ parts per million, and four only a very slight trace. Eighteen wall-papers were examined, ten of which were negative, two showed .0025 milligrams of arsenic to every gram of material, and six furnished but a very slight trace.

These results, are perhaps, not very surprising when we remember that arsenic, at least in traces, is present in nearly every substance. Gantier and Bernard have found it to exist normally in men and animals; it is found in the ash of many vegetables, such as peas, cabbage, lentils, etc., while the results of more recent experiments indicate that there is probably no substance not containing arsenic, at least in trace.

Universal Medical Inspection.

We wisely spend large sums of money yearly in the inspection of cows, elevators, various forms of machinery, etc. We insure our houses against fire and our lives against demise. Most of us allow the dentist to inspect our teeth at least once a year. Why would it not be wise, asks the editor of the *Ladies' Home Journal*, to go a step further in this direction and invite the doctor to be an inspector of the family and the home? For centuries the Chinese have done this, and the custom is gaining favor in Germany. To have the doctor inspect the home and the family every so often, to suggest sanitary, physical and dietary measures for improvement, in fact, "to pay the doctor to keep us well," would be, Mr. Bok considers, a genuinely preventive, and a more rational, method.

Trolley Cars in Winter.

Following a long discussion of the subject of street car ventilation, especially of that problem as it presents itself in the cold season, the first definite attitude to be taken by any representative body was recorded in the *Boston Transcript* for November 13. Before a meeting of the Public Utilities Committee of the Boston Chamber of Commerce the subject was argued out by Drs. J. Payson Clark, John R. Howes, Vincent Y. Bowditch and Walter C. Barley, and the committee finally voted in favor of open cars during the winter. It was decided that closed cars were unhealthy, that the air was germ-laden, and that a far better standard of health could be attained were the open car put into use. Doctor Howes is reported as saying that he believed that the amount of fresh air which would result would greatly benefit sick people, particularly the tuberculous, by strengthening their lungs as well as their whole constitutions. It would seem that the semi-convertible car could be used with this end in view to a much greater extent than is at

present the case. Representatives of the Boston transit companies will be requested to appear before the committee very soon in order to ascertain why some such plan if practical, should be carried out.

Mental Hygiene Conference and Exhibit.

"The Mental Hygiene Movement, of which this conference and exhibit form a part, is a well-organized endeavor to reduce the alarming amount of mental impairment in the United States by making public careful statements of the causes of mental diseases, by securing earlier medical treatment, and by preventive social service with individuals threatened with mental breakdown. The movement also includes a medical survey of institutions caring for the insane in the United States for the purpose of determining the best measures to improve standards of care among the 200,000 sufferers from mental disorders."

Thus the movement is defined in the program foreword describing the great conference of mental hygienists held at the College of the City of New York, November 8 to 15. A wonderful series of conferences took place, extending over eight days, participated in by men of authority in all subjects touching this great national question, and most skillfully designed to reach special groups, such as nurses, clergymen, parents and teachers, college men, physicians, college women and the general public.

The program described the chief objects of the National Committee for Mental Hygiene in the following words:—

"To work for the conservation of mental health; to help raise the standard of care for those in danger of developing mental disorder or actually insane; to promote the study of mental disorders in all their forms and relations and to disseminate knowledge concerning their causes, treatment and prevention; to obtain from every source reliable data regarding conditions and methods of dealing with mental disorders; to enlist the aid of the Federal Government so far as may seem desirable; to coördinate existing agencies and help organize in each State in the Union an allied, but independent Society for Mental Hygiene, similar to the existing Connecticut Society for Mental Hygiene.

"The National Committee for Mental Hygiene aims to serve as a clearing-house for the nation on the subject of mental health, the prevention of nervous and mental disorders, the care and treatment of the insane; and aims also to serve as a coördinating agency for all State and local agencies interested in these problems."

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